# LITERATURE ON OAT : AVENA SATIVA

## A BIBLIOGRAPHY ANALYSIS

(1991-2000)

DISSERTATION

*SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF*

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2001

*Dedicated to My*

**Parents**

**&**

**Guru**

*"Who always been a source of inspiration, guidance and* **encouragement for me "**

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## CERTIFICATE

This is to certify that ***Ms. PARUL TIYAGI*** has completed her dissertation entitled **"OAT-AVENA SATIVA"A Bibliometric Analysis from 1991-2000"**. in partial fulfilment of the requirements for the degree of **Master of Library and Information Science** (2000-2001). She has conducted the work under my supervision and guidance. I deem it fit for submission.

**(S. Mustafa K.Q. Zaidi)**

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# CHAPTER-I

# BIBLIOMETRICS

The word bibliometrics is derived from the combination of Latin and Greek word biblion, meaning book paper. On the other hand the word metrics indicates the science of metre i.e. measurement and is also derived either from the Latin or Greek word metrics or metrikos each meaning measurement. So bibometrics connotes the science of measurement pertainint to boois or documents.

Bibliometric is relatively a subject of recent origin it is that branch of information science which lies between the border areas of the social and physical science.

Bibliometics is now being vigorously pursued and with result it has been found that one fourth of all the articles published in Library and information science periodicals are on bibliometrics and its related topics.

It is a quantitative study of various aspects of literature on topics and is used to identity the patterns of publication authorship citations and/or secondary journal coverage with the objective dynamics of the growth of knowledge in the areas under consideration.

Bibliometics today has attained sophistication and complexity having national, international and interdisciplinary character.

**Pritchard** and **Witting** compiled a bibliography on the subject comprising 600 entires covering the period 1874 to 1959 which incidentally rose to 2032 entires in 1980 as per compilation of Hjreppe. In 1982 Hjreppe again published a supplement to his 1980 bibliography covering 518 items of information.

The techniques of bibliometrics are simple to complex in nature and are not always free from controversy. The basic units of bibliometrics are all facets of written communications, such as primary and secondary periodicals. Articles and abstracts published in them, bibliographies articles books, monographs and other media of comunications.

**Origin:-** bibliometrics was first coined by Pritchard in 1969, its usage and practice can be tracked back to the second decade of this century.

**Cole** and **Eale'l** study on the "History of comparative Anatomy part I: A statistical Analysis" is considered to be the first bibliometric study. Where for the first time in 1917, the expression Statistical Analysis has been used in the literature.

**Hulme** was the first to use the expressions statistical bibliography in 1923 and later it was used by many others. **Gross** 1922 and Gross's study is considered to be the third study in the field based on citations. After Hulme, the term statistical bibliography was used by **Henkle** in 1938 in his article". The periodical literature of Biochemistry" and **Gosnell** in his dissertation in 1943 and later in his article of 1948. Later **Fusseler** in 1948 and 1949 **Raising** in 1962. **Barker** in 1966 and Pritchard in 1968 and 1969 have used the term 'Statistical Bibliography' in their work.

The historical development of the term statistical bibliography has been traced by witting in a foot note. As the term was considered very clumsy, not very descriptive, and can be confused with statistics itself or bibliographies on statistics.

**Derk DeSolla price** published some of the first-observations of exponential rate of growth in the number of scientific journals. More recently in 1971 **Goffman** developed the Epidemic Theory for the growth rate of specific scientific area of activity, **Vickery**, Clark and others have also illustrated a recent applications of this types of analysis.

**Other Analogus Term:-** bibliometic is just one of the many sciences whose name ends with "matrics" many scientists have

used the term under different names but the concepts were more or less suplementary and complemetary to each other with some broader and narrower extension of human ideas.

One name that was used quite early but very scarcely was statistical analysis of the literature by Cole, and Eales in 1917. While Hulme used the term as 'Statistical Bibliography' in 1923.

**Librametrics:-** In 1958 Great Indian library Scientist S.R. Ranganathan said that it is necessary for librarians to develop 'Librametry' under this term hje suggested using of mathematical and statistical methods for analysis library activities and library resources. But this term did not take its place in library scince and was forgotten for many years later. It was called 'Libramatrics.'

**Scientometrics:-** In 1969. Another term 'Scientometrics' was given by V. Nalimov & Z. Mulchenko in their book "Scientometrics": the investigation of science as according to their scientometrics is a complex of quantitative methods which are used to investigate the processes of science.

Scientometrics is a new emerging discipline which uses bibliometric measurement for evaluations of factors like scientific progress, levels of scientfic development, social relevance and impact of the application of science and technology on society.

**Informatics:-** The term informatics given by German scientists A. Blackert and S. Zygel in 1982 as a newly formed branch of Science using mathematical and statistical method to investigate scientific and technical information on theoretical level and practical information activities.

**Morales** describes information as "a kind of scientific information activity, at the same time a component part of information science and its studies various metric aspects of its study object in order to increase the information activity, efficiency of information establishment."

International Federation of Documentation's (FID) committee for informatics was constituted in 1980.

**Definition:-** Many attempts have been made to define the terms bibliometrics:-

1] **Alan P ritcard (1969):-** The applications of mathematics and statistical methods to book and other media of communications".

2] **Raising (192):-** The assembling and intepratation of statistics relating to books behaviour pertaining to it".

3] **Fairtharne:-** "The quantitative treatment of properties of recorded discourse and behaviour pertaining to it".

4] **British Standards Institutions:-** Define, "The use of document and patterns of publication in which mathematical and statistical methods have been applied." This is basically similar to Pritchards original definition.

5] **Hawkinns (1977):-** in his on line bibliometrric study interpreted Bibliometic as "quantitative analysis of the bibliographic feature of a body of literature".

6] **Nicholas and Ritchie:-** Define, "Bibliometrics...provides information about the structure of knowledge and how it is communicated. They further added that "Bibliometric studies fall mainly into two broad categories. Those describing the characteristics or feature of a literature (descriptive studies) and those examing the relations formed between components of literature (behavioural studies)."

8] **Schrader:-** "the scientific study of recorded discourse."

9] **Sen gupta:-** "Organisation classification and quantitatively evaluation of publication patterns of all macro and micro communications along with their authorship by mathematical and statistical calculus".

**PURPOSE AND SCOPE**

The scope of bibliometric includes the studying of relationship within a literature or describing a literature. Typically these

descriptions focus on consistent patterns involving Authors, Monographs, Journals, Subject, Language and Forms.

**Bibliometric studies fall mainly into two broad groups:**

a) Descriptive Studies:

Those describing the characteristics or features of literature.

b) Behavioural Studies:-

Those examining the relationship formed between components of a literature.

The techniques of bibliometric are simple to complex in nature. The basic units of bibliometric are all facets of written communication, such as Primary and Secondary periodicals, Articles, Books, Monographs and other media or communication. Bibliometric techniques have extensively applied equally in sociological studies of Science Information management, Librarianship, History of Science including Science policy, Study of Science and Scientists and also in different branches of social sciences. Bibliometric laws are useful in understanding some of the information phenomena and may help in planning many of the library activities, as they indicate certain basic patterns and relationships governing information items and activities. The study mostly relates to quantification of items and their pattern of distribution. Hyperbolic distribution and exponential growth are

the prominent trends underlying information and document phenomena. The studies throw light on the pattern of growth of literature, productivity and influence of authors, interrelationship among different branches of knowledge, distribution of terms in information storage and retrieval pattern of collection build up, their use and the like.

**Purpose of Bibliometrics**

**Hulme** assigned its purpose as to shed light on the process of written communication and of the nature and course of development of a descriptive means of counting and analyzing the various facets of written communications.

According to Dr. S.N. SENGUPTA "The purpose of bibliometrics is to provide quantitative analysis of the phenomenon going with documents, their organization, use and services in library and information centres and systems. It offers to the information worker a type of statistical technique for the study of characteristics and attributes of literature and that of communication media".

**The main purpose of bibliometric study is:**

- To find major form of literature.
- To prepare a ranked list of journals.

- To make a comparison between ranked journals.
- To identify the country with greatest literary output.
- To find out the chronological scattering of all cited literature
- To ascertain the amount of utilization of language.

**Some other purposes are:**

- To develop norms and standardization
- To regulate inflow of information and communication.
- To identify authorship and its trends in documents of different subjects.
- To measure useful news of adhoc and retrospective SDI services and so on.

**Utility of Bibliometrics in Research**

At present, bibliometric work often provides the background for a more practical task. It is an established technique covering wide area of knowledge. It has therefore been able to involve scholars from many of these disciplines. Consequently it has attracted scholars from different disciplines or their respective fields. Day by day, it is attaining sophistication and complexity having nationa, international and interdisciplinary character. It has established itself as a viable and distinctive research technique for

studying science of science based on bibliographic data. As a matter of fact, its backbone lies in its sound theoretical foundation most efficiently and effectively laid by some pioneers like Gross, Lotka, Bradford, Zipf, Derek J. De Solla Price, Bookstein, Massavesik, Cole Brother, Pritchard, Garfield, Hulme, Fairthorne and many others who are all not basically librariaans, but belong to different branches of knowledge.

The techniques evolved by these pioneers are capable of throwing light to various complicated problems faced by many while handling information to qualify the process of written communication. It has established itself as a viable and distinctive measurement of human knowledge. Data analysis both of citations and of volume of publications year by year can be useful in planning retrospective bibliographies.

Bibliometrics also provides information about the structure of knowledge Its classification studies give information about the subject, language and country relationship, which is based on literary warrant. Bibliometrics is very useful in any field of research or in any discipline or it can be used in small and manageable ways by individuals, to improve some part of library or information service.

**Indian Contribution to the Development of bibliometrics:-**

In terms of growth of this subject, India had made many attempts and can find a place as an important contributor among the worlds prominent bibliometrically advanced countries US, UK, Canada and others.

Indian has to being with a FID committee on informations, established in Delhi, around 1985, which also promotes bibliometric. Many books have appeared dealing with bibliometrics, including those by I.N. Sengupta, I.K. Ravichandra Rao, B.M. Gupta, S. Subba Rao etc. There are at least dozens of Indian schoars who have published their contributes in Indian and international sources to the name of a few B. Maheshwarappa, B, Guha R. Shalini Urs, B.K. Sen.

**Laws of Bibliometric:-** The three fundamental laws which laid the formation of bibliometrics are:

1. Bradford's law of Scattering of scientific Papers
2. Lotka's Inverse square law of scientific productivity
3. Zipfs's law of word occurrence

**Some of the other empirical laws are:**

(i) **Price's Square root Law of Scientific Productivity:-** This law states that " half of the scientific papers are contributed

by the square root of the total number of scientific authors. In other words, $N^{1/2}$ sources yield a fraction 1/2 of the items. This phenomenon is associated with the occurrence of invisible colleges. This law is sometimes called 'Roussean's law' since Jean jacques Roussean had mentioned the same thing quite clearly in his 'Social Contract' about the size of the elite, i.e. those participating in the government. Egghe and Rossean argue that Prices law is not generally valid. This can also be treated as an extension of the success breeds success principle originally developed by Simon in 1955.

(ii) **Garfield's Law of Concentration:-** Garfield talked about the number of journals involved in publishing the literature of a single field. He did not say anything about how much the journal in one field might overlap with other fields. In fact there is a significant degree of overlap. Several studies have shown that relatively few journals are involved in the publishing of an overwhelming majority of the material in a subject. A study of the Science Citation Index (SCI) database showed that 500 journals accounted for 70% of the material indexed in SCI in 1969. Almost half of the 3.85 million references published that year was found to emanate from only 250 journal. This type of evidence makes it

possible to move from Bradford's law of dispersion to Garfield's law of concentration.

The law states that "a basic concentration of journals is the common core or nucleus of all field". In other words, the tail of the literature of one discipline consists, in a large part, of the cores of the literature of other disciplines. So large is the overlap among disciplines that the core literature of all scientific disciplines involves a group of not more than 1000 journals.

**(iii) Sengupta's Law of Bibliometrics:-** This is basically an extension of the Bradford's law. It states that during phases of rapid growth of knowledge in a scientiffic discipline, articles of interest to that discipline appear in increasing number of periodicals distant from that field". Mathematically Sengupta's law stands in the following form;

$$f(x+y) = a+b \log(x+y)$$

Where (f9x + y) is the cumulative number of references as contained in the first (x+y) most productive journals, x indicate number of journals in the same discipline and by stand for number of journals of unrelated disciplines (y>x) and a and b are two constants.

Ravichandra Rao summarises other empirical laws in one of his papers and those who are interested can go through the reference. He has also listed more important bibliometric modes.

**Objectives by Brooks:-**

i. Design of more economic information systems and network;

ii. Improvement of efficiency rates of information handling process;

iii. Identification and measurement of deficiencies in bibliographical services;

iv. Discovery and elucidation of empirical laws that can provide a basis for developing a theory of Information Science.

On the other hand, qualitative application studies emphasize practical utilization of research findings. Some of the finding which are fruitful used in library management are:

i. Identification of core literature;

ii. Ranking publications in zones of diminishing importance;

iii. Establishing a transition point between zones of higher and lower utility;

iv. Tracing the spread of ideas as study of epidemics; and

v. Classifying segments of literature through inter connection co-citations

**Two more points added by Susan Artandi. They are:**

i. Determination of the impact value of a given document;

ii. Location of the criticisms of published results of research and experiment.

iii. Some of the above points will be discussed while examining the application of citation analysis. Whatever may be the types of study, Burton id go opinion that the product of bibliomatric analyse productivity t of his or her own staff and how it compares to other comparable units, and

iv. To the research analyst may wish to define a new research project or compare his or he own progress to that of broader spectrum such as other institutions, related disciplines, or other nationalitties.

**BIBLIOMETRIC LAWS:-** The three fundamental laws which laid the formation of bibliometrics are:

1. Lotka's Inverse Square Law of Science Productivity:

2. Bradford's Law of Scattering of Scientific Papers; and

3. Zipf's Law of Word Occurrence.

**Lotka's Law:- In 1926, Alfred J. Lotka** proposed his inverse Squae Law correlating contributors of scientific papers to their number of contributions. His law provided fundamental theoretical base for bibliometric studes involving authorship. He was interested in determining "the part which men of different calibre contribute to progress of science". For this, he checked the decennial index of 'Chemical Abstracts' 1907-1916 and counted the number of names against which appeared 1, 2, 3 etc., entries, He tabulated the data for 6, 891 names beginning with leter 'A' and 'B' Similarly the data from the Auerbach's Geschietftafeln der physic was also collected for the 1325 physicists, Lotka then plotted the graph on the logarithmic scale, the number of author and he found that in each case the points were closely scattered about a straight line, having slop of approximately two one. On the basis of these data. Lotka deduced a general equation, for the relation between the frequency 'Y' pesons making 'X' contributions as follows:

$X^n Y = \text{constant}$

And for the sepcial case n = 2, the constant is 0.6079. Further summarised the results as follows.

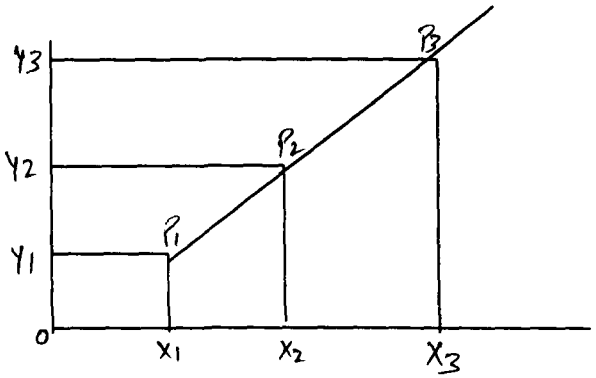
"In the case examined it is found that the of persons making 2 contributions is about one forth those making one contribution, the number making 'n' contributions is about 1/ $n^2$ of those making one and the proportion of all contributions is about 60 percent".

In other words, for every 100 authors contributing one article, 25 will contribute two articles, about will contribute 3 article and will contribute 4 article, and so on. Through, the law was based on the study of chemistry and physics literature later it has generated much interest and attracted the attention of researchers and it has been applied and tested in many other fields. The graph being as rising curve API and then continues as a

**Bradford's Law of Scattering:**-Samuel Clement Bradford, another pioneer of bibliometrics, should be considered for his classic paper "Sources of information on specific subject." Which is the paper published on observations on scattering Bradford examined two bibliographies prepared in the Science Library (Britain) on Applied Geophysics (1928-31) and Lubrication (1931-32) and he prepared lists of journals arranged by decreasing order of source items contributed by the journals to the bibliographies. He noticed that in each subject there were a few very productive source, large number of sources constantly diminishing productivity. The whole range of periodicals was thus seen as "a family of successive generations of diminishing kinship,

each generation being greater in number than the proceeding, and each constituent to generation producing inversely according to its degree of remoteness.".

In the list of periodicals by diminishing productivity, Bradford identified three groups of periodicals that produced approximately the same number of articles on the subject but the number of periodicals in these three equiproductive ones increased by a constant factor. Based on this he state his law as follows: "If scientific periodical arranged in order of decreasing productivity of articles on a given subject that may be divided into a nucleus of periodicals more particularly devoted to subject and several groups or zones containing the same number of articles as the nucleus when the number of periodicals in the nucleus and succeeding zones will be as $1:n:n^2$.




Bradford also plotted graphs of the cumulative number of source items R(n) versus the logarithm of the cumulative number of journals (log n). The resulting graphs for applied Geophysics

and Lubrication were similar to the graph shown in Fig. 1. Such a grapah, is sometimes called as Bradford bibliograph.

The graph being as rising curve API and then continues as a straight line. The rising part of the graph represents the number of highly productive journals. The point p1, p2 and p3 on the bibliograph are the boundaries of three equip productive zones in which the same number of articles as the nucleus (represented by $(Y_1) = y_1, y_2, y_3$) derived from an increasingly larger number of journals (represented by OXI, X1, X2, X3, X5). The law attracted the attention of many researchers in the field and has been the main topic of many articles in the literature.

**Zipf's law of Word Occurrence:-** Zipf's developed and extended an empirical Law, as observed by Estoup, governing a relation between the rank of a word and the frequency of its appearance in long text. If 'r' is the rank of the word and 'f' is its frequency, then mathematically Zipf's law can be stated as follows:

$rf = c$, where 'c' is a constant

His law states that in a long textural matter is words are arranged in their decreasing order of frequency, then the rank of any given word of the text will be inveresly proportional to the frequency of occurrence of the word. Thus, these three laws are respectively based on (i) number of authors contributing in a

discipline or other field; (ii) distribution of articles in a set of journals; and (iii) ranking word frequency in a particular set of documents.

## APPLICATION OF BIBLIOMETRIC LAWS:-

**Bradford's Law:-** The sttistical regularity, pointed out by Bradford's law provides an objective means of determining zones of relative richness or value to given kind of library collection. This has implications to the acquisition process in library. A library can safely stock the journals which belong to the core or nuclear zone. It is advisable to extend the purchase list to the next zones till the budget limits. If at all the budget is elastic, a point will be reached at which it would be desirable to obtain copies of articles in the journals on demand rather than subscribing to the journals lancaster provides an excellent hypothetical example of applying Bradford's law in periodical collection building, while discussing the principle of diminishing returns. Brookes is of the view that if the total expenditure on periodical provision is limited to the fraction 'f' of the sum needed to cover the subject completely, the buying of periodicals may be supplemented by the buying of photocopies of the relatively few relevant papers published in the peripheral periodicals.

While preparing bibliographies we are faced with the problems of coverage, the journals that are to be scanned etc. Bradford's distribution can be fruitfully used to estimate the total size f bibliography and the periodicals that should necessarily be included in the list of items to be covered.

On the application side of this law, the studies of Goffman and Morris and Ravichandra Rao are significant. Goffman and Morris found that the pattern of journal usage in the Allen Memorial Library follows a Bradford distribution. Rao, through his analysis of circulation date collected from six Canadian University Libraries, proved that the rank distributioin of transactions follow a Bradford distribution. Bradford's law is very much akin to the Pareto's law relating to wealth distribution and the 80:20 principle used in warehouse management and the Mandelbrot distribution.

Naturally this law is applied to study not only the scattering of publication, but also in other spheres of activity also. A study conducted by Garg and Lalitha Sharma of R & D indicatioin in Indian industry using Bradford's law bears testimony to this fact. By analysing the R &D expenditure of 452 in-house R &D units in different sectors of the Indian industry, they had identified 19 in-house R & D house as the core, 60 as the medium and the rest as

small. As compared to medium and small level in-house R & D units, there is a heavy concentration of manpower deployed, papers, published, patents filed, processes/products developed in the core in house R & D units. This shows the superiority of the core not only in the R % D expenditure but also in other yardsticks too.

**Zipf's Law:-** Zipf's law can be effectively used in the generation of semiautomatic or automatic indexes useful for an information retrieval system. Its use has increased tremendously with the emergence of natural language indexing of textual matter especially in electronic form. Several studies aimed at finding out the pattern of frequency distribution of descriptors of a thesaurus and the distribution of indexing terms are available. A prominent one among them is that of Fedorowicz.

Zunde and Slamecka have developed a function for the optimum distribution of indexing terms by the number of postings. This should make it possible to transmit information with maximum efficiency.

Zipf's law provide a measure of the richness in vocabulary of an author. This technique can be used for deciding the correct authorship of disputed works. For example, if there is difference of opinion as to the correct author of a work, the word

predilections of the attributed authors can be analysed either manually or using a computer. Once the frequency of occurrence of favourite words are decided, kthe disputed text can be analysis to see similarity and there by decided the author conclusively.

The law is also used for identifying words more frequently used in different foreign language. The words are taught first in the instructioinal programmes of foreign language.

**Emile C. White** observes that the superimposition of the Bradford distribution over the linear Zipf distribution, which demonstrates the emergence of more used and popular items may yield a technique to describe the pattern of book use by library patrons. She feels that applied to circulation data, these formulations can support such policies as shortened loan periods for heavily used books and the identification of a core collection.

**Lotka's Law:-** Lotka's proposition led to a whole amount of studies on scientific productivity. Such productivity studies have gained momentum in the post-second world war period. This in fact, has culminated in the rise of a new discipline called scientomerics. Scientometrics is defined as the study of the measurement of scientific and technological progress. It provides an understanding of the structure of scientific activity, the disciplines being researched, the organizations involved, the

strength and disciplines being researched, the organizations involved, the strength and deficiency in the scientific group and their communication channel at different levels of aggregation. It follows the trajectory of econometrics in the use of quantitative data, concepts and models and extensive use of mathematical and statistical techniques of modeling and data analysis.

Scientific productivity studies have been made from different angles. Impact of social change on scientific productivity, relationship of publication output on scientific recognition, identification of elates in different disciplines, occurrence of discoveries in different cultures etc. are some of the approaches made in this line.

An interesting study of scientific productivity made three decades back is that of Yuasa's. Yuasa's was a statistician, whose statistical study of the scientific achievements in various countries showed the shifting of the world scientific dominance from one country to another. He found out that this dominance, shifted from Italy to Britain, then to France, from France to Germany and finally to USA in the $20^{th}$ century.

Price , who had traced the development of science since Babylon and plotted the growth of big science from little science had observed that Lotka's; law applied equally well to the

productivity of scientists in the 17th as well in the 20th century. This meant that majority of publications emanated from a handful of people. We have already seen this as price's square root law. Similarly, the conclusion of an extensive review of early studies of scientific productivity made by Narin was that scientific talent was highly concentrated in a limited number of individuals.

For a comprehensive treatment of the application of biliometic laws, readers are advised to refer to **Egghe and Rossuean,** albeit, abound in mathematical expressions.

**Bibliometric Measurements:-** The bibliometric measurement are derived from the concept of citation indexing. It was based on the English legal System, which operates under the doctrine of stare deisis precedent, on the basis of which Garfield developed 'Science Citation Index, Social Science Citation index and arts and humanities index.

Direct citation counting :citation counting is technique that determines how many citation of a given document , author, journal ect., has received over a period of time ,originally used by gross and gross .the rationale for is that citation are objective indicators of use and therefore an article, author, journal that frequently cited is moe useful or productive, as the case may be, than one that is less frequently cited. In order to offset the

limitations of citation counting, some modified measures have been suggested. The 'impact factor' 'immediacy index' are two such measures. Garfield, who coined the term impact factor defines it as "the ratio the number of times a journal is cited in a given time period to the total number of source items published in the journal, during specified period of time." The impact factor is a measure of frequency with which the average of cited article in a journal has been cited in given time period to the total number of source items published in the journal, during specified period of time". The impact factor is a measure of frequency with which the average of cited article in a journal has been cited in particular year. It offset of age, size the frequency of a publication of journal on the frequency of citation. The immediacy index is method of showing the frequency with which a material recived by the articles during the year to the number of articles published. Recnelty, first has suggested the discipline impact factor (DIF), a method of determining core journals for discipline, which is similar to the impact factor (DIF), a method of determining core journals for discipline, which is similar to the impact factor, which measures of the given discipline.

**Bibliographic Coupling:-** The concept of bibliographical coupling was first suggested by Fano, bu Kessler elaborated, tested and coined the term, It is number of common references

cited in two document that indicates the degree of similarity of contents of the cited papers. Two source documents containing a large number of common references are said to have high coupling strength are likely to be on the same topic. It observed that he concept of relationship has certain drawback and not seem to be a valid unit of measurement because if two papers are citing a third paper, they may or may not be cited and identical piece of information of third paper being cited. Further Tagliacozzo is of the opinion that "the fact that two papers have refernece in common is no guarantee that both papers are referring to the same piece of information. So, it merely an indication of the existence of the probability of relation between two documents".

**Co-citation:-** The concept of Co-citation was for first time suggested independently by Small and Marshakova almost simulataneously in 1973 and later developed by Small, who propsed a new method of analysing citations, to generate clusters of related papers. The number of times two papes are cited papers. Co-citation is dynamic measure in that co-citation strength of cited papers can be subsequent literature. But one of the disadvantages of co-citation technique is that, it requires comprehensive citation data.

# CHAPTER-II

## INTRODUCTION

Cereals crops are always played an pivotal role in human nutrition and thus, both directly and indirectly, have been closed associated with the socio cultural development of those communication.

Oat is a dominant cereals of temperature and mediterian region. Oat rank sixth in World Cereal production following wheat, maize, rice barley and sorghum. Grain yields of oats have been greatest in countries such as Germany, Sweden Finland, France and the U.K.

About 80% of the Oat growing region lie in the Northern temperature zone. The chief oat production regions are North America, Europe, Russia etc. The crop was introduced in India in the recent part.

It is chiefly grown in U.P. Punjab, West Bengal, M.P. and in some parts of Maharashtra.

The Antient Greek knew the genus very well, they called it "Bromes" as the Latens called it "Avena". But these names were commonly applied to species which are not cultivated, and which are needs mixed with cereals.

Oats sow themselves on rubbish heaps by the way side and near cultivated grow more easily than other cereals and sometimes

persist in such a way as to appear wild. This has been observed in widely separate places, as Algeria, Japan, Paris and the North of China.

Avena Sativa, the Oat is an important Cereals and fodder crop.

It is highly Nutrition the grain crops of Oat certain 16% protein and 8% fat. Protein benefits of oats include amelioration and gastrointestinal function and glucose metabolism.

In some area of the country these advances may be attributed to increases attention to the husbandry of the Oat crop as a livestock feed.

**STRUCTURE:**

Like other Cereals. Oats also belong to the irramineae the grasses. Oats are usually associated with the other grasses which have a similar niche in agriculture namely the temperature Cereals, Wheat, Barley and Rice. Where the grain is the commercially valuable part.

Oats should also be considered as a close relation of the peremial wild and forage grasses such as rye grass, timothy reserve etc.

The Oats are monocotyledons, the seedlings having one cotyledon or seed leaf. Its root systems are fibrous without a dominant taproot. The Avena Sativa produce branches, tillers, at the base of the stem. The leaves, differentiate from points on the stems called nodes and are narrow and unstalked, almost parallel sided and parallel veined. The floral structure of Oast are considered to be highly specialized. The inflorescences are compound, comprising a series of flowering branches, spikelets. The spikelets may be arranged in a apnicle where they are born on branches of Oats Each spikelet has one to several individual flowers. The florets comprises the female part a superior ovary and the male parts the stamens-their numbers being three or a multiple of three scale like remants of the petals, lodicules, may sometimes be found the base of the floret. The floret is enclose with in the protective brad or scales the outer lemma and the inner palea. At the base of each apikelt are additional scales, glumees, which vary in size and forum from species to species. The single ovary develops into a cayopsis, comprising an embryo and an endospum. The organ storing energy mainly in the form of starch for the geminating seedlings.

The structure of the Oat plant changes continuosly throughout its life cycle in line with its objective or reproducing itself.

**Development of Avena Sativa:**

At flowering the stem or culem which beans the leaves and the inflorescences, secret. The stem consist of a series of hollow cylindricals tubes, internods, of which there are usually between four and seven, joined at nodes where the stem is solid. The position of the nodes is marked externally by a narrow dark-coloured-zone encircling the stem immediately above it.

The first stem, the main stem, will produce a number of tillers. Primary tillers arise in the axis of the lower older leaves of the main stem as its base.

Secondary tillers arise in the axils of primary tillers arise during the early phase of the life cycle between emergence of the third leaf and stem elongation. They vary in age and consequently a hierarchy in size, lef number and the organs is established.

At flowering, most if not all tillers which have survived to this stage will bear an inflorescence. The leaves are arranged in two rows alternating of opposite side of the stem. The flattened upper part of the leaf, the lamina or blade, is joined to the sheath, the basal part, where the stem. The fully emerged lamina is long and narrow, tapering to a point and flat with a small keel. The rachis, bearing spike lets at their tips Its flower part consists of the male parts, the stamens of which there are three and the

female parts the round hairy ovary. The ovary has two whitish feathery organs at its apex, the stigmas which are born on very short stalks, styles. Usually only the two basal florets in the spikelet are fertile, producing caropses. At maturity the lemma and palea are usually firmly attached to the caryopsis at its base so that together they comprise of harvested grain.

The caryopsis in Avena Satina is long and elliptical in shaps and is covered with fine, silky hairs. The ovary wall (Pericarp), seed coat (Testa) and nucellus comprising several compressed and fused layers of cells together constitute the surface layers, or bran. A single layer of cells, aleurone although developmentally part of the endosperm, surrounds both it and most of the embryo. The aleurone layer plays a key role in germination when it both produces and secrets. The enzymes that degrade and permit translocation of food material from the endosperm to the embryo.

The embryo, germ, which lies on the dorsal side of the caryopsis so that it is overlaw by the lemma, comprises two to three leaf primordial of the plumule and the two to three root primordial of the radical. Between the embryo and the endosperm lies the scutellum which secrets enzymes during germinatioin and transfer of food material from the endosperm of thegrowing embryo.

The root system in "Avena Sativa" comprises the seminal and the adventition roots. The three to four seminal roots develop from the roots primordia present in the embryo of the planted seed. Adventition roots arise at the based modes of the main stem and tillers which from the crown. The position of the crown is determined by the elongation of the first internode of the stem below the coleoptile, the mesocotyl. This raise the apical meristum from the depth where the seed has been planted to just below the surface of the soil. The apical meristum remains in this position while leaf and spiketels primordial are being initiated until elongation fo the internodes begins. Two to three of the basal internodes do not elongate and therefore the older leaves associated with their nodes remain at the base of the stem throughout the life cycle. Adventitions roots constitute the major part of the root system and are produced continuously throughout the early part of the life cycle upto anthesis. This number of seminal roots produced small and although they are present from germinatioin, they continue to function throughout most of the life cycle.

It is an annual species like the other temperate cereal and complete their life cycle from sowing germination to harvest/maturity in 6-11 months. The distinction between autumn and spring types is the main determinant of maturation period.

Development is continuous and lathough the convertion is to divide the grass life cycle into vegetative and reproduction phases, this makes a highly integrated. The external morphological development f Oat plants comprises the achievement of full size of the leaves, tillers, stem and panicle.

**History of Oats: "Avena Sativa"**

The Archaelogical evidence for early crop production is based to a considerable extent ont eh distributioin of carbonized grains and the impression of grains in pottery fragments and although increasingly archaeobotanical and polynological techniques are being recruited.

The mere presence grain, either in impression or carbonized form, indiacates only that the particular society was in possession of this grains and gives no clue as to its importance in the economy or its relevance other cereals (Dennell, 1977; Bailey and Jarnam, 1982).

As in medieval times, the Oat crop remained an important if not a dominant, feature of most agricultural economics. Oats were the principal cereals grown in the mid-sixteen century. Oat grains were malted to beer. In the North and West, where the Oat remained a vital human staple, yield improvement would carry with it obvious benefits and in more favoured localities would

permit into, Other marketable products. It developed a growing interest in the notion of cereal-based dies for ruminants and monogastric animals and by the early decade of the nineteenth century. A detailed knowledge about the structure and anatomy of Oats has been published by several eminent scientists in recent decades. The anatomy i.e. the tissue structure of the organs of the seedling and mature Oat plant, has been comprehensively described by Kaufman and Brock (1992), Bonnett (1961).

**Varities:**

The varities of Oats are Naked Oats, White, Red and Black Oats, grown as Spring crops, sustained both people and animals and locally produced varieties became removed for their particular qualities. The black Oats of West Oreland were considered suitable only for horses. The staffordshine red oats regarded as yielding the best quality oatmael for human consumption, while the generally grown White Oats yielded the heaviest grain for conversion into bread and pottage (Finberg 1967; Keridge, 1973). The winter Oats varieties grow in the United States has been published in the USDA publication, and classification. In California, and classified varieties are grown from full seeding.

**Ecologi cal Factors:**

**Climate:-** Oats are adapted to cool most regions of the world. They can, however, grow in extremely cold places as wells Red Oats are grow primarily in warm climate viz; Southern United States. Mediterran regioin of Europe and Africa, Australia and Argentina Oats require more $H_2O$ than any other cereal crop. Drought often cause great damage. High temperature does not suit Oats unless they are given plenty of $H_2O$ High temperature during flowering lead to the formation of empty spikelets commonly called "Blast". Hot, dry weather at the time of ripening is determental and leads to premature ripening of host humid weather favours prevalence of certain diseases which reduces grain yield.

**Soil:-** Oats can be grown in a very wide range of soil types. They are less sensitive to acidity can be grown on a wide range of soils with reasonable drainage and fertility oats prefer heavey, soils, but they can be grown ever on poor and exhausted ones.

**Cultivation:-** Oats, like Wheat have 2 varieties the winter and spring varieties depending upon the season of planting. In India, Oats are cultivated as a Rabi-crop. The land is prepared in a way similar to that of wheat. It is ploughed three or four times. The seeds are sown soon after the cessation of rains in the month of September or October.

Oats generally planted with other crops oats should prefer follow a crop which is deep rooted one. The yield of Oats is good if the previous crop manured. The fodder crop may be supplied with ammonium sulphated or oil cake.

The sowing season extends from October to December. In case of grain crops the sees I ssown in rows 25-30 a part when as in case of fooder crop sees are sown by broadcast method.

**Harvesting:-** The crop matures in 3-4 months. The plains are harvested when the leaves are still green and the grains are not fully ripe. The harvested cropies left for a few days for final drying and maturing of the grains and is then subjected to the threshing in a manner similar to that of wheat and barley.

**Kinds of oats:-** There are three broad groups of oats:

A) Hexaploids SPPS.

(i) Avena Sativa – Most important cultivated Oat.

(ii) Avena fatua - Troublesome need in Oat fields.

(iii) Avena Steritlies – Similar to Avena fatua but with large spickelets.

(iv) Avena Breyzantina – Warm climate cultivated Oat.

(v) Avena Nuda – Lemma and plea incomplete fused with the grain yielding a naked seed easily on threshing not much cultivated.

B) Tetraploid SPPS.

(i) A barbata – Tall,weak, slinder, range grass f the Western United States.

(ii) Avena abysfinica – Grown forage in the desert areas of North Africa.

C) Diploid SPPS.

(i) A bievis – The short Oat.

(ii) A. Stregosa - The sand Oat.

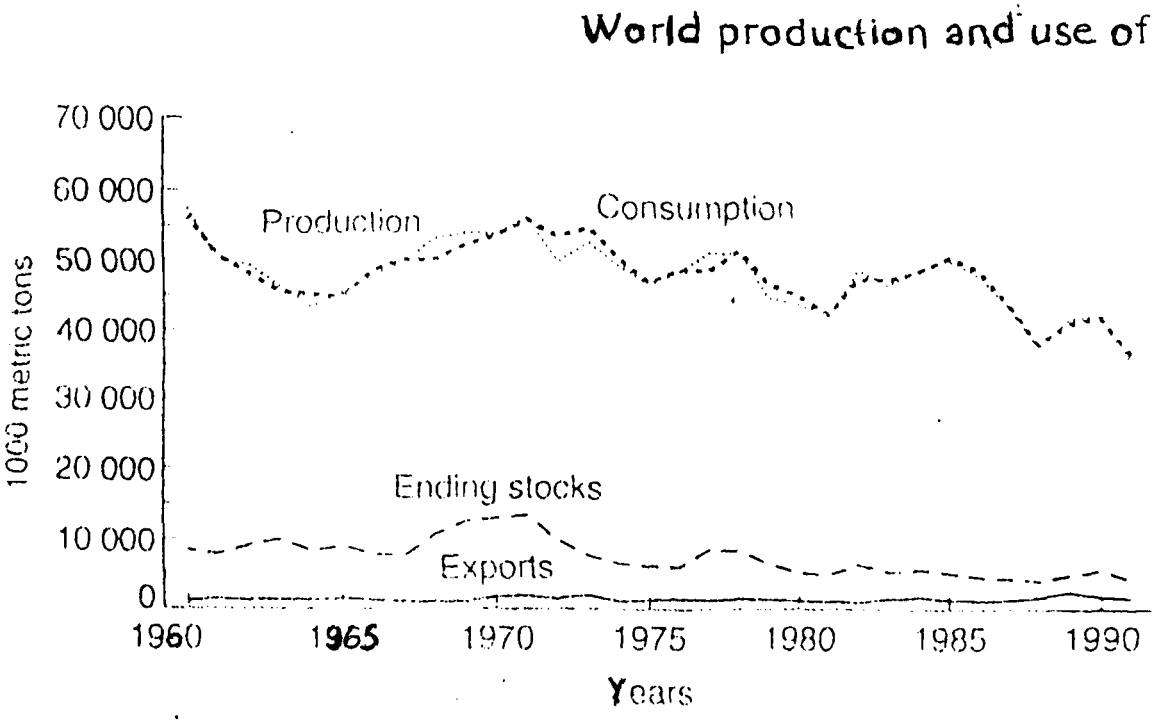
(iii) A. Wiestive – The desert Oat; and

(iv) A. nudi brevis.

The diploid Oats are of little commercial importance and they are cultivated to a limited extent in parts of Europe.

**Uses:-**

1) Oats are the most nutritious of all cereals because they have a high fat; protein and mineral content. The flour of oat is usually called Oatmeal. It is used for making biscuits, cakes and breakfast food. Only 3 or 4 % of its is used as human food in the form of rolled Oats.




World oats production, exports and ending stocks, 1960-91.

2) They are very good for feeding horses and domestic animals.

3) Oat staw is used as an emergency feed and as an animal bedding.

4) The oats are grown for green forage.

5) Oats are useful plants in crop rotation.

6) Oats are also used in beverages, a brand of oat bran beer in currently being promoted in U.S.A.

7) Because of their nutritional profile, oats are used in baby foods.

8) Oats use in snack foods such as 'Apple' Oatmeal spice and strawberry Oatmeal Almond in USA.

**Conclusion:**

Avena Sativa enables plants breeders develop and growers to exploit its genetic potential to their financial benefit. Changes in structure during the life cycle of the oat plant enable the crop both to optimize its exploitation of available resources for growth and production of yield and to minimize the effects of temporal and spatial variation in supply of these resources and of fluctuations in temperature which plays an important role in controlling development.

The fixedness and flexibility of oats structure and development which to varying degrees characterize all plants life, are therefore assets in its success as a crop utilize by human kind.

# CHAPTER-III

# OBJECTIVE, SCOPE AND METHODOLOGY

The exponential growth of literature and development of libraries generated several evolutionary studies about the effectiveness and efficiency of information services. These studies let to the identification and application of appropriate quantitative measuring techniques known as Bibliometrics.

Reference material are required for up up-to-date information in various fields due to the explosion change noticed in all domain of human activity.

**Objectives:-**

B.C. Brookes gave that such general objective.

i) Design of more economic information system.

ii) Improvement of efficiency rates of information handling process.

iii) Identification and measurement of deficiencies in bibliographical services.

iv) Discovery and education of empirical laws that can provide a basis for developing theory of information science

**Scope:-** The scope of bibliometrics includes studying the relationship (citation studies) or describing a literature. Typically

these description focus on consistent patterns involving authors, journal or subject. language.

**Bibliometric Laws:** The three fundamental laws which laid the formulation of bibliometrics are:

i) Lotka's Inverse Square law of Scientific productivity.

ii) Bradford's Law of Scattering of Scientific Papers.

iii) Zipf's law of Word Occurrence.

**Objectives:-** The specific objectives of this studies are the following.

i) To identify a list of core journals

ii) To determine the language of literature.

iii) To determine the country wise distribution of articles on outs (Avena Sativa).

iv) To determine the year wise distribution.

**Topic Selection:-** I have consulted various sources for the selection of topic such as chemical abstract, Index medicus and Biological Abstract.

Finally I selected oats (Avena Sativa) from biological abstract on the basis of interest in botany and availability of its references.

**Reference Cards:-** The reference contains the information as follow: First there are surname of authors in capital letter, then fullstop(.). Then title of the article, than fullstop (.). Then name of the journal with vol. Number, issue no. pag no. then fullstop(.). Then the year of publication, then fullstop(.). on the next line have of the institution and country and them on the next line language of the document.

After making reference card, analysis these card yearwise and prepared the table of yearwise distribution, single and multiple authorship, journals countries and finally the languages. These tables are arranged in the decreasing order of the no. of authors, journals, country and language then analysis is does on rankwise table and preparation of frequency calculation of percentage, graphical representation and statistical analysis are also used. The reference and size is 5' x 3"

Example

SCOLTK. (BOYER), SHOTWELL (MARK A.) AND LARKINS (BRAIN A.). Evidence for the translation control in oats. Journal Biol. Chem. 267 (24) Jan. 17449-17449.9092

(Deptt.) of Botany, University. Wisconsin, USA).

English

**Analysis:-** We analysis the different things

i) **Yearwise distribution:-** yearwise productivity of papers consult 1440 references during the period of study 1991-2000. The analyse no. of articles per year and the percentage.

**ii) Productivity of Authors:-** The productivity of authors mean which author has been written how many articles. The authors have been arranged according to decreasing order of article then list to a rank

**iii) Nature of Authorship:-** First collected the data yearwise and arranged the card according to nature of the authorship i.e. single authorship and multiple authorship.

**iv) Ranking of Journals:-** The journals are arranged according to decreasing order of productivity so that the core journal is find out.

**v) Country wise Distribution:-** In the countrywise distribution different country are arranged according to the decreasing order of the no's of articles.

**vi) Languagewise distribution:-** The articles are arranged language wise and then given a rank as well as % value is calculated after analysing the literature I have given application of bibliometric law i.e. Bradford's law and finally the conclusion of the study.

**CITATION ANALYSIS:-** Around 1440 reference were found from biological abstract during year 1991-2000 many of the journals in which these references were percent in were not available in department of Botany, AMU from the references, I have found out that the core journal is crop science covering 52 articles during the period of 1991-2000. The other major journals which are available in departmental library of Botany, AMU, are as follows planta, annals of Botany (London) crop science (USA), New Phytologist etc.

Due to various factors such as shortage of time, scope and demand of dessertating. I have department of Botany. AMU about 52 in the number for the citatioin analysis.

The citation references is also written on the 5' x3" card this card contain the information as follows:-

Surname of the author in capital letter and forename of the author in bracket in small letters. Then the title of the article, then the journal's cited year given above. After preparation of table analysis is Dow on the information in given table these table have prepared for the ranking of authors ranking of journals, type of cited document, for cited journals, cited year of the articles and preparation of frequency, calculatioin of

percentage, graphical representation and statistical analysis are also used.

Example

| |
|---|
| ARTHUR (MARRY A.), RUBIN (GAIL) |
| Uptake and Accumulation of Selenium... |
| Environmen. Toxicol Chem. |
| 1962 |

**Analysis:-**

i) Distribution of Papers and citation 1991-2000.

ii) Ranked list of journal cited

iii) Ranked list of journals cited.

iv) Identification of joint and single authorship

v) Identification of co-citation

# CHAPTER-IV

# DATA ANALYSIS, INTERPETATION AND REPRESENTATION

## CHRONOLO' GICAL DISTRIBUTION

This table shows the chronological distribution of paper published during the period 1991.

According to the table we can find out the maximum number of articles were published in 1995. It is 12. 2% 01 the total publication of the 1440.

The second most productive year is found to be 1994. Which is 11.8% of the total publication.

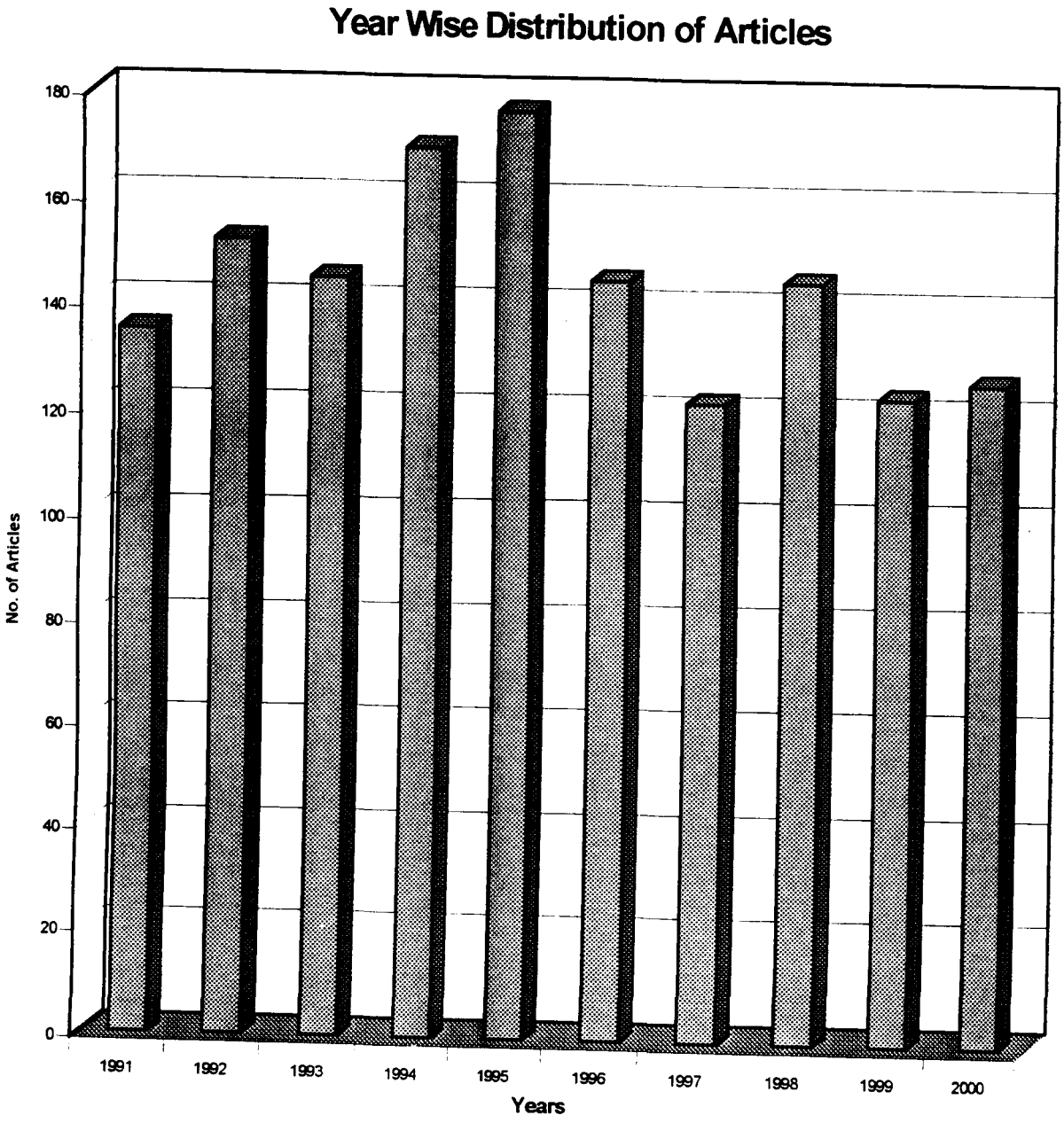
The third most productive year is 1992. Which is 10.5% of the total publication. The fourth most productive year is 1992. Which has 10.5% of the total publication.

The percentage of 1997 is minimum because some of references of the topic are not covered by the biological abstract of 1997, and will be published in respective volume of biological abstracts.

## Chronological distribution

**Table 1**

| Year | Freq. | %age | Cum% |
|---|---|---|---|
| 1991 | 135 | 9.3% | 9.3% |
| 1992 | 152 | 10.5% | 19.8% |
| 1993 | 145 | 10.0% | 29.8% |
| 1994 | 170 | 12.2% | 41.6% |
| 1995 | 177 | 12.2% | 53.8% |
| 1996 | 145 | 10.0% | 63.8% |
| 1997 | 122 | 8.4% | 72.2% |
| 1998 | 145 | 10.0% | 82.2% |
| 1999 | 123 | 8.5% | 90.7% |
| 2000 | 126 | 8.7% | 99.4% |
| **Total** | **1440** | **99.4** | |


Year Wise Distribution of Articles
No. of Articles
180
160
140
120
100
80
60
40
20
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Years

## PRODUCTIVITY OF AUTHORS

Table- 2 Shows the productivity of authors of paper published during 1991-2000. According to is table the most productive author is STACHELIN (l.A.) who contributed 35 papers (0.81%) frequency the total publication. The rank of this author is 1.

This second most productive author is YOUN (HYE-WON) who contributed 34 papers (0.78%) of the total publication. The rank of this author is II.

This third most productive author is ROSE (J.L.), Contributing the 25 papers (0.58%) of the total publication. The rank of this author is III.

The fourth and fifth most productive author are PELTOMEN (S) and MCLEAN ® who have contributed 20 papers (0.46%) each. The rank of these authors are IV. 2625 authors contributed only I papers each.

# Productivity of Authors

## Table - 2

| S No. | Rank | Author's Name | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | STACHELIN (L.A.) | 4 | 4 | 4 | 3 | 3 | 3 | 1 | 1 | 6 | 6 | 35 |
| 2 | 2 | YOUN (HYE-WON) | 5 | 4 | 4 | 4 | 3 | 3 | 4 | 5 | 2 | - | 34 |
| 3 | 3 | ROSE (J.L.) | - | 3 | - | 4 | - | 4 | 3 | 3 | 5 | 3 | 25 |
| 4 | 4 | PELTONEN (S) | 5 | 3 | 1 | 1 | - | 5 | 2 | 2 | - | 1 | 20 |
| 5 | 4 | MCLEAN ® | 1 | 2 | 1 | 1 | 3 | 2 | - | 3 | 2 | 5 | 20 |
| 6 | 5 | MENKIEWICZ(P) | 2 | - | - | 2 | 3 | 1 | 4 | 3 | 2 | 1 | 18 |
| 7 | 5 | NEL(P.C.) | 1 | 1 | 1 | 1 | 3 | - | 3 | 5 | 1 | 2 | 18 |
| 8 | 5 | OMEMADA(M) | - | - | 3 | 3 | - | 1 | 3 | 2 | 3 | 3 | 18 |
| 9 | 6 | STATE(J.K.) | 4 | - | - | 4 | 2 | 1 | - | - | 2 | 2 | 15 |
| 10 | 6 | MARTINELLI(JOSE) | - | 1 | 1 | - | 5 | - | 5 | - | 1 | 2 | 15 |
| 11 | 7 | MONTAGUE(M.J.) | 2 | 2 | 2 | 3 | - | 1 | 1 | 1 | - | 1 | 13 |
| 12 | 7 | LASSON© | 1 | - | - | - | 3 | 3 | 2 | 4 | - | - | 13 |
| 13 | 7 | KATSIOTIS (A) | 4 | 1 | 1 | - | 1 | - | 1 | 1 | 3 | 1 | 13 |
| 14 | 7 | JIN(C.D.) | - | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 3 | - | 13 |
| 15 | 8 | CAREFOOL (J.M.) | 1 | 1 | - | 1 | 3 | - | - | 2 | - | 4 | 12 |
| 16 | 8 | COCHRON (L) | 2 | - | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 12 |
| 17 | 8 | DOELLING (S) | - | - | - | 4 | 1 | 1 | 1 | 1 | 3 | 1 | 12 |
| 18 | 8 | FREY (K.J.) | 1 | - | 1 | 4 | 5 | - | - | 1 | - | - | 12 |
| 19 | 8 | FEDERIZZI ® | - | - | - | - | - | 3 | 1 | 4 | 3 | 1 | 12 |
| 20 | 8 | HRYB (S.I.) | 2 | 2 | 2 | 2 | - | 1 | 1 | 1 | 1 | - | 12 |
| 21 | 9 | VENDER (J) | 1 | 3 | 1 | 1 | 1 | - | 1 | 3 | - | - | 11 |
| 22 | 9 | WILLSON (K) | - | - | - | 1 | 1 | 1 | 1 | 5 | 1 | 1 | 11 |
| 23 | 9 | ZNI-LAN (JIN) | 2 | - | 1 | 2 | - | 2 | 1 | 3 | - | - | 11 |
| 24 | 9 | KIM (SURWON) | 3 | 1 | 1 | 1 | - | - | - | 2 | 3 | - | 11 |
| 25 | 9 | LAL (MENDI) | 1 | 3 | 2 | 1 | 1 | 3 | - | - | - | - | 11 |
| 26 | 9 | NI-H (M) | - | 2 | - | 1 | - | 1 | 1 | 1 | 2 | 3 | 11 |
| 27 | 10 | LOFFEN (H.J.M.) | 1 | - | - | - | 3 | 1 | 2 | - | 3 | - | 10 |
| 28 | 10 | MARKHAND (G.S.) | - | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 29 | 10 | OXELFELT (PER) | - | 1 | 1 | - | 1 | - | 3 | 1 | 2 | 1 | 10 |
| 30 | 10 | PALMGREN (M.G.) | 1 | - | 1 | - | 1 | 2 | - | - | 3 | 2 | 10 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 10 | RAI (R.K.) | 3 | 1 | 2 | - | 1 | 2 | 1 | - | - | - | 10 |
| 32 | 10 | SONG (PILL-SOO) | 2 | - | - | - | - | 2 | 2 | 3 | - | 1 | 10 |
| 33 | 10 | TAL (J.A.) | - | 1 | 1 | 1 | 1 | 2 | - | 2 | 2 | - | 10 |
| 34 | 10 | TARIQ-TAN (M) | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | 10 |
| 35 | 10 | HARBAR (K.N.) | 1 | 1 | 1 | 1 | 2 | - | - | 1 | 2 | 1 | 10 |
| 36 | 10 | VERMA (S.K. | 3 | - | - | - | 3 | - | - | 2 | 1 | 1 | 10 |
| 37 | 10 | WARD (T) | 1 | 1 | 2 | - | - | - | 1 | 1 | 1 | 3 | 10 |
| 38 | 11 | KIM (DONGHERY) | - | - | - | - | 1 | 2 | 1 | 1 | 1 | 3 | 9 |
| 39 | 11 | KATO (I.I.) | 1 | 1 | 1 | - | - | - | - | 4 | - | 2 | 9 |
| 40 | 11 | LEON (JENUS) | - | - | 1 | - | 1 | 1 | 1 | 1 | 3 | 1 | 9 |
| 41 | 11 | LEPEZ (SUZANA) | 3 | - | 3 | - | - | 2 | - | - | 1 | - | 9 |
| 42 | 11 | MOSES (H.S.) | 1 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | 2 | 9 |
| 43 | 11 | SALAS (D.E.) | - | - | 1 | - | 4 | - | - | 2 | 1 | 1 | 9 |

18 Authors contributed 8 Articles

38 Authors contributed 7 Articles

52 Authors contributed 6 Articles

76 Authors contributed 5 Articles

98 Authors contributed 4 Articles

256 Authors contributed 3 Articles

582 Authors contributed 2 Articles

2625 Authors contributed 1 Articles

## AUTHORSHIP DISTRIBUTION PATTERN

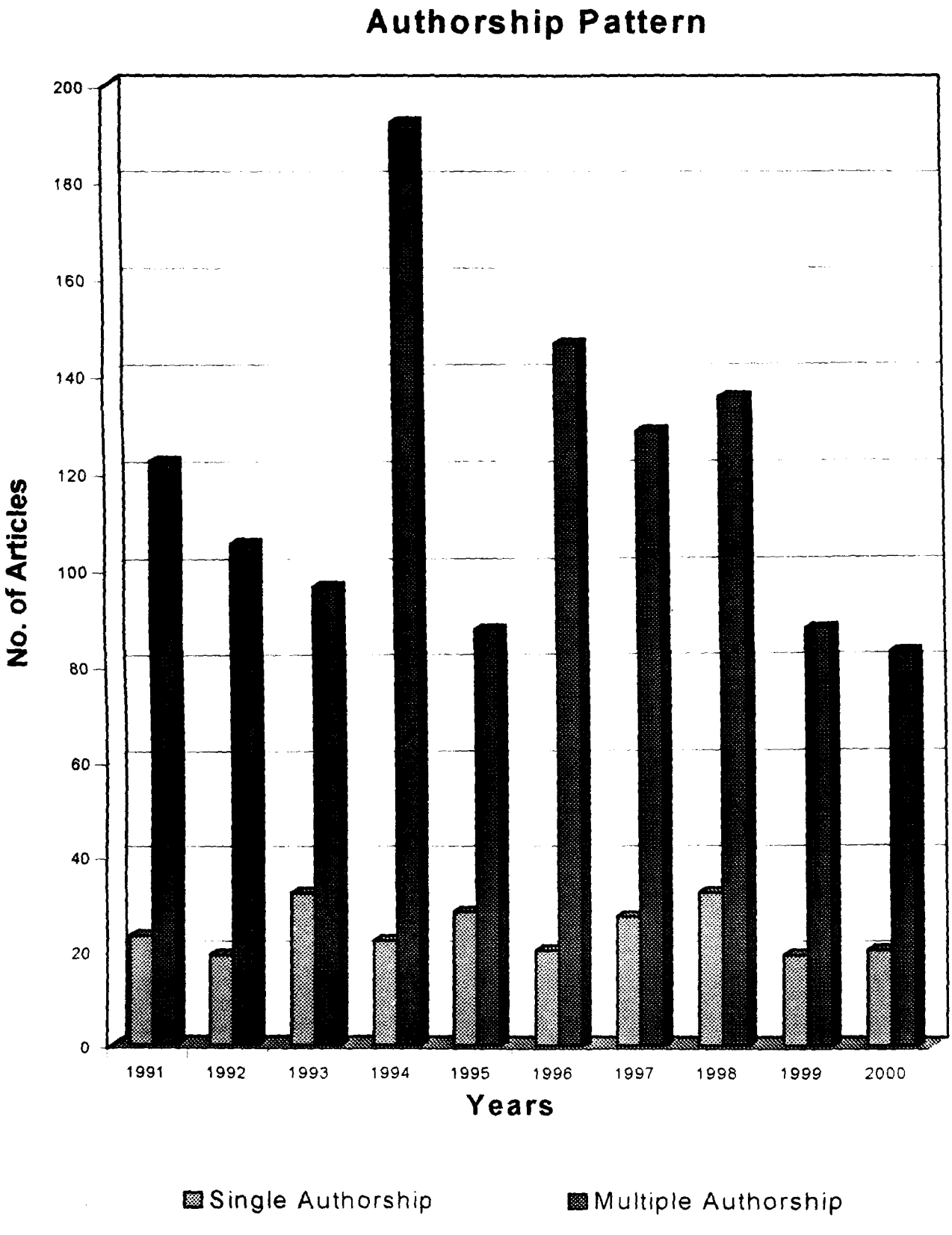
Analysis of data in Table - 3 shows that multiply author is predominant. Out of the total 1440 articles (83.19%) are multiple authors during the period of 1991 - 2000.

The year 1993 shows the highest production of single authorship. There were 32 incidence of single authorship. Where as, the year 1994 shows the highest production of multiple authorship. There were 192 incidence of multiple authorship.

The year 1992 and 1999 shows the minimum production of single authorship (7.85) as well as of multiple authorship (i.e.6.84) of the total production in the year 2000.

**TABLE - 3**

| Year | Single Authorship | % | Multiple Authorship | % |
|---|---|---|---|---|
| 1991 | 23 | 9.50 | 122 | 10.11 |
| 1992 | 19 | 7.58 | 105 | 8.76 |
| 1993 | 32 | 13.22 | 96 | 8.01 |
| 1994 | 22 | 9.09 | 192 | 16.01 |
| 1995 | 28 | 11.5 | 87 | 7.26 |
| 1996 | 20 | 8.26 | 146 | 12.1 |
| 1997 | 27 | 11.10 | 12 | 10.6 |
| 1998 | 32 | 13.20 | 153 | 12.7 |
| 1999 | 19 | 78.50 | 87 | 7.26 |
| 2000 | 20 | 8.26 | 82 | 6.84 |
| **Total** | **242** | | **1198** | |


Authorship Pattern
No. of Articles
200
180
160
140
120
100
80
60
40
20
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Years
Single Authorship
Multiple Authorship

# Authorship Pattern

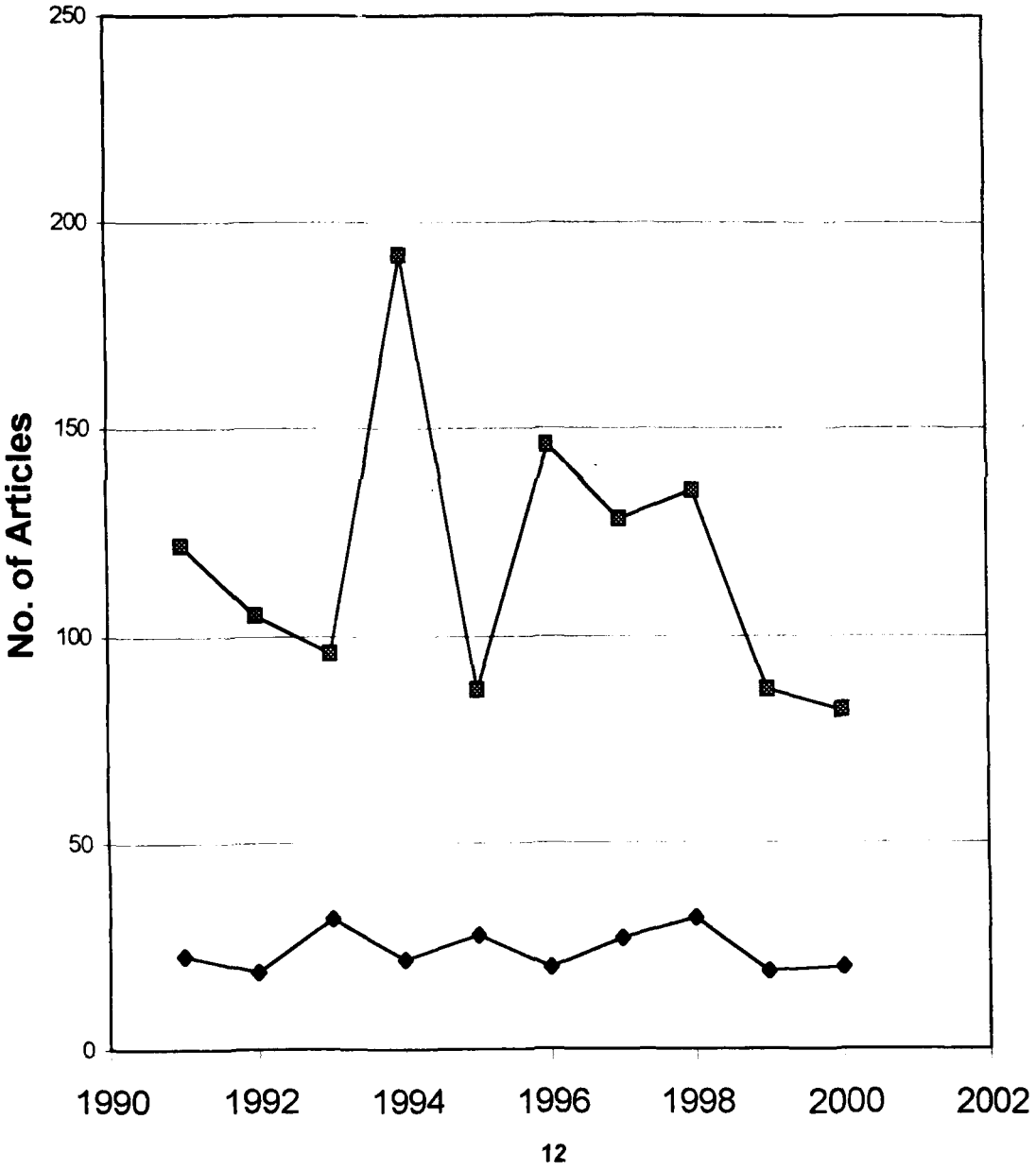


**Table - 4**

| Single Authorship | | Multiple Authorship | | Total Number |
|---|---|---|---|---|
| No. of authors | % | No. of authors | % | Of authors |
| 242 | 5.61 | 4067 | 94.38 | 4309 |
| | | | | |

The percentage of the authorship in the year 1992 is minimum because some of the references of the topic are not covered by the biological abstract of 1992, and will be published in the respective volume of biological abstract.

## RANKING OF PERIODICALS

show the ranking of periodical during the 1991-2000. The 1440 journals, article were analysed in detail.

After analysing the journal of crop science is given rank I. It's frequency is the 95 (6.59%) articles and the other journals are arranged in the decreasing order of the articles. The 'Plant Physiology' is the II Ranked i.e. 69 articles (4.79%). The third ranked periodical the 'Agronomy journal ' has 38 articles. It has 2.63% of the total production.

| S No | Rank | Name of Journals | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Crop science | 14 | 7 | 7 | 6 | 12 | 7 | 11 | 8 | 12 | 11 | 95 | 6.59 |
| 2 | 2 | Plant Physiology | 8 | 22 | 15 | 9 | 4 | 3 | 5 | 4 | - | 1 | 69 | 4.79 |
| 3 | 3 | Agronomy J. | 4 | 1 | 3 | 11 | 7 | 3 | 3 | 3 | 3 | - | 38 | 2.75 |
| 4 | 4 | Canadian J. of Plant Science | - | 11 | 9 | 4 | 2 | 2 | - | 2 | 2 | - | 31 | 2.63 |
| 5 | 5 | Planta | 10 | 4 | 8 | - | - | 6 | - | 2 | - | - | 30 | 2.08 |
| 6 | 6 | Phyto-chem. | 3 | 1 | 3 | 2 | 1 | 3 | 2 | 3 | 4 | 1 | 23 | 1.59 |
| 7 | 6 | J.production Agri | 5 | 6 | - | 2 | 5 | - | 1 | 2 | 2 | - | 23 | 1.59 |
| 8 | 7 | Plant disease | 4 | 1 | 5 | 3 | - | 2 | 1 | 3 | 1 | 2 | 22 | 1.52 |
| 9 | 7 | J. of Plant Physiology | 1 | 3 | 5 | 3 | 2 | 3 | 2 | 1 | - | 2 | 22 | 1.52 |
| 10 | 7 | Euphypica | 4 | 3 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 1 | 22 | 1.52 |
| 11 | 7 | Soil tillage Research | - | 3 | 4 | 3 | - | 1 | 3 | 1 | 4 | 3 | 22 | 1.52 |
| 12 | 7 | Genome | - | 1 | 1 | 4 | 8 | 4 | 2 | 1 | - | 1 | 22 | 1.52 |
| 13 | 8 | Physiologia Plantarium | - | - | 1 | 4 | 4 | 4 | - | 3 | 4 | 1 | 21 | 1.45 |
| 14 | 9 | Theory of Applied Genetics | 1 | 1 | 3 | 4 | - | 2 | 2 | 2 | - | - | 20 | 1.38 |
| 15 | 10 | Weed Tech. | - | 2 | 2 | 5 | - | 5 | 1 | - | - | 3 | 18 | 1.25 |
| 16 | 11 | Weed Science | - | - | 3 | 1 | 5 | 1 | 2 | 2 | 3 | - | 17 | 1.18 |
| 17 | 11 | Physiology of Molc. Plant Pathology | 2 | 1 | 3 | 4 | - | 2 | 1 | 2 | 1 | 1 | 17 | 1.18 |
| 18 | 12 | Australian J. of Ex. Agri | 1 | 2 | - | 8 | 3 | 1 | 1 | - | - | - | 16 | 1.11 |
| 19 | 12 | Soil Science | 1 | 3 | 1 | 1 | 4 | 3 | - | 1 | 1 | 1 | 16 | 1.11 |
| 20 | 13 | Canadian J. of Plant Pathology | - | 2 | 3 | 3 | 1 | 2 | 1 | - | 1 | 2 | 15 | 1.04 |
| 21 | 14 | Indian J. of Agronomy | - | 3 | 1 | 4 | 1 | - | 2 | 2 | 1 | - | 14 | 0.91 |
| 22 | 14 | Photo-chem.& Photo-biol | 1 | - | 5 | 1 | 2 | 1 | 2 | 2 | - | - | 14 | 0.91 |
| 23 | 15 | Plant Mol. Biol. | 1 | - | 1 | 2 | 2 | - | 2 | 3 | 1 | 1 | 13 | 0.90 |
| 24 | 16 | Field crops research | 1 | 1 | - | 2 | 3 | 1 | 1 | 2 | 1 | - | 12 | 0.83 |
| 25 | 17 | Australian J. of Plant Physiology | - | 2 | 1 | 1 | 1 | 1 | 1 | 3 | - | 1 | 11 | 0.76 |
| 26 | 17 | Indian Agronomy | - | - | - | 5 | 4 | 1 | 1 | - | - | - | 11 | 0.76 |
| 27 | 18 | Weed Research | 2 | - | 1 | 2 | 1 | - | 1 | 2 | 1 | - | 10 | 0.69 |
| 28 | 18 | Fiziol Rasterst | 2 | 2 | 2 | - | - | 1 | 1 | 2 | - | - | 10 | 0.69 |
| 29 | 18 | Plant cell Report | 1 | - | 1 | - | 2 | - | - | 2 | 2 | 2 | 10 | 0.69 |
| 30 | 18 | Plant & Soil | - | - | 3 | 1 | 1 | - | 2 | 3 | - | - | 10 | 0.69 |
| 31 | 18 | Indian J. of Agri. Science | - | - | - | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 10 | 0.69 |
| 32 | 19 | J. of Agronomy of crop Science | 1 | - | 4 | 4 | - | - | - | - | - | - | 9 | 0.62 |
| 33 | 19 | Plant Breeding | 1 | 4 | 1 | - | - | 1 | - | 1 | 1 | - | 9 | 0.62 |
| 34 | 19 | J. Plant Nutrition | - | 2 | - | 1 | 1 | - | 2 | 1 | 1 | 1 | 9 | 0.62 |
| 35 | 19 | Cereal Chemistry | - | 2 | - | 1 | 2 | - | 1 | 1 | 2 | - | 9 | 0.62 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | 19 | Federation European Biochem. Societies | - | 1 | 1 | 3 | 1 | 2 | - | - | - | 1 | 9 | 0.62 |
| 37 | 19 | Fertilization Research | - | 2 | 2 | 4 | 1 | - | - | - | - | - | 9 | 0.62 |
| 38 | 19 | Acta Agri. Scand sec. B. of Soil Plant Sci. | - | - | 2 | 2 | 2 | 1 | - | - | 1 | 1 | 9 | 0.62 |
| 39 | 19 | Canadian J. of Plant | - | - | - | 3 | 1 | - | 1 | - | 3 | 1 | 9 | 0.62 |
| 40 | 20 | Plant Soil | 1 | 5 | 2 | - | - | - | - | - | - | - | 8 | 0.55 |
| 41 | 20 | J. of Sci. Food & Agri | - | - | - | - | 2 | - | - | 2 | 3 | 1 | 8 | 0.55 |
| 42 | 20 | J. of Agronomy & Crop Sci | - | - | - | - | - | 4 | 2 | - | - | 2 | 8 | 0.55 |
| 43 | 20 | New pathology | - | 2 | 4 | - | 1 | - | - | - | - | 1 | 8 | 0.55 |
| 44 | 21 | Physiology Plant | 1 | 4 | 2 | - | - | - | - | - | - | - | 7 | 0.48 |
| 45 | 21 | Phyto-pathology | - | 2 | 3 | 3 | 1 | 2 | 1 | - | 1 | 2 | 7 | 0.48 |
| 46 | 21 | J. of Plant growth Regulation | - | 2 | 2 | 5 | - | 5 | 1 | - | 3 | 1 | 7 | 0.48 |
| 47 | 21 | Production Sci. | - | - | 6 | - | - | - | - | - | 1 | - | 7 | 0.48 |
| 48 | 21 | Plant & Cell-Physiology | - | - | 1 | 4 | 1 | 1 | - | - | - | - | 7 | 0.48 |
| 49 | 21 | J. of Genetics & Breeding | - | - | 1 | 2 | 1 | 2 | 1 | - | - | - | 7 | 0.48 |
| 50 | 21 | Plant Sci | - | - | 1 | 1 | - | 1 | - | 1 | 2 | 1 | 7 | 0.48 |
| 51 | 21 | Fitopatol Brassica | 1 | - | - | - | 1 | 1 | 4 | - | - | - | 7 | 0.48 |
| 52 | 22 | J. of Agric.Sci. Finland | 3 | 1 | 1 | - | 1 | - | - | - | - | - | 6 | 0.41 |
| 53 | 22 | J. of Exp. Botany | 2 | 1 | - | 2 | - | - | - | 1 | - | - | 6 | 0.41 |
| 54 | 22 | Plant cell Environ. | 1 | - | 1 | 1 | 1 | 1 | 1 | - | - | - | 6 | 0.41 |
| 55 | 22 | J. of Eco. Of Entomology | 1 | 3 | 2 | - | - | - | - | - | - | - | 6 | 0.41 |
| 56 | 22 | J. of Cereal Science | 1 | - | - | - | - | 2 | 2 | - | - | 1 | 6 | 0.41 |
| 57 | 22 | Annual Botany | 1 | 1 | - | - | - | - | 2 | - | 2 | - | 6 | 0.41 |
| 58 | 22 | Seed Science Tech. | 1 | 1 | 2 | - | - | - | - | - | 1 | 1 | 6 | 0.41 |
| 59 | 22 | Cereal of Res. Communi-cation | - | 1 | 1 | - | - | 1 | 1 | - | - | 2 | 6 | 0.41 |
| 60 | 22 | New Pathologist | - | - | - | 2 | 1 | 1 | - | 1 | 1 | - | 6 | 0.41 |
| 61 | 22 | Communi-cation in Soil Sci.& Plant Analy. | - | - | - | - | 3 | - | 2 | 1 | - | - | 6 | 0.41 |
| 62 | 22 | Summa Phyto-pathology | - | - | - | 2 | 1 | - | 2 | - | 1 | - | 6 | 0.41 |
| 63 | 22 | Agric. Eco-system & Environ | - | - | - | - | - | 2 | 2 | - | 1 | 1 | 6 | 0.41 |
| 64 | 23 | Protoplasma | 1 | 1 | 1 | - | 2 | - | - | - | - | - | 5 | 0.34 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | 23 | Planta Physical | 5 | - | - | - | - | - | - | - | - | - | 5 | 0.34 |
| 66 | 23 | Advance Plant Science | 1 | - | 1 | 1 | 1 | - | - | 1 | - | - | 5 | 0.34 |
| 67 | 23 | Plant Science | 3 | 2 | - | - | - | - | - | - | - | - | 5 | 0.34 |
| 68 | 23 | Applied Plant Science | 1 | 1 | - | - | - | - | 1 | 1 | 1 | - | 5 | 0.34 |
| 69 | 23 | Canadian Plant disease Survey | - | - | - | 2 | - | 3 | - | - | - | - | 5 | 0.34 |
| 70 | 23 | Biochemistry | - | - | - | - | 1 | 3 | - | - | 1 | - | 5 | 0.34 |
| 71 | 23 | Proceeding of National Academy of Sci. of USA | - | - | - | - | - | - | 1 | 3 | 1 | - | 5 | 0.34 |
| 72 | 23 | Agric & Food Sci. in Finland | - | - | - | - | - | 1 | 1 | 2 | 1 | - | 5 | 0.34 |
| 73 | 24 | Acta Agri. Scand | 2 | - | 1 | - | - | - | 1 | - | - | - | 4 | 0.27 |
| 74 | 24 | Photosyn-thetica | 1 | - | 2 | 1 | - | - | - | - | - | - | 4 | 0.27 |
| 75 | 24 | J. of Nematology | - | 1 | - | 1 | - | 2 | - | - | - | - | 4 | 0.27 |
| 76 | 24 | Pestic Science | - | 1 | 1 | 1 | 1 | - | - | - | - | - | 4 | 0.27 |
| 77 | 24 | Plant Physiology Biochem. | - | 2 | - | 2 | - | - | - | - | - | - | 4 | 0.27 |
| 78 | 24 | J. of Biologychem. | - | 1 | 2 | - | 1 | - | - | - | - | - | 4 | 0.27 |
| 79 | 24 | J. of Agri. Sci. | - | 1 | - | - | 1 | - | - | 2 | - | - | 4 | 0.27 |
| 80 | 24 | Indian J. of Agric Research | - | 2 | - | - | - | 1 | 1 | - | - | - | 4 | 0.27 |
| 81 | 24 | Experimental Agric | - | 2 | 1 | - | - | 1 | - | - | - | - | 4 | 0.27 |
| 82 | 24 | S. Africa J. of Plant Soil | - | 2 | - | - | - | - | - | - | 1 | 1 | 4 | 0.27 |
| 83 | 24 | J. of Fertilizer Research | - | - | 1 | 3 | - | - | - | - | - | - | 4 | 0.27 |
| 84 | 24 | Plant growth regulation | - | 1 | - | 1 | - | 1 | - | - | 1 | - | 4 | 0.27 |
| 85 | 24 | Crop Protection Biologia | - | - | - | 1 | 2 | - | - | - | 1 | - | 4 | 0.27 |
| 86 | 24 | European J. of Biochemistry | - | - | - | 2 | - | 1 | - | - | 1 | - | 4 | 0.27 |
| 87 | 24 | Plant Pathology | - | - | - | - | 4 | - | - | - | - | - | 4 | 0.27 |
| 88 | 25 | J. Annal Chem. Societies | 1 | 1 | 1 | - | - | - | - | - | - | - | 3 | 0.20 |
| 89 | 25 | Environ. Entomol | 1 | - | 1 | - | - | - | - | - | 1 | - | 3 | 0.20 |
| 90 | 25 | Biology Fertile Soil | 2 | - | - | - | - | 1 | - | - | - | - | 3 | 0.20 |
| 91 | 25 | Biochem. & Biophysics Acta | 1 | - | 1 | 1 | - | - | - | - | - | - | 3 | 0.20 |
| 92 | 25 | Agronomic | 1 | 1 | 1 | - | - | - | - | - | - | - | 3 | 0.20 |
| 93 | 25 | Common Soil Sci. Plant Annal | - | 1 | 1 | 1 | | - | - | - | - | - | 3 | 0.20 |
| 94 | 25 | Indian J. of | - | 1 | - | - | - | - | 1 | - | 1 | - | 3 | 0.20 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Animal Science | | | | | | | | | | | | |
| 95 | 25 | J. Phytopathol | - | 1 | - | - | 1 | 1 | - | - | - | - | 3 | 0.20 |
| 96 | 25 | J. Bacteriol | - | 1 | - | - | - | 2 | - | - | - | - | 3 | 0.20 |
| 97 | 25 | Environmental Toxicol Chem. | - | 1 | - | - | - | - | - | 1 | 1 | - | 3 | 0.20 |
| 98 | 25 | Revistan Societies Braszoote | - | 1 | - | 2 | - | - | - | - | - | - | 3 | 0.20 |
| 99 | 25 | Canadian J. of Social Science | - | 1 | 1 | 1 | - | - | - | - | - | - | 3 | 0.20 |
| 100 | 25 | Geobioss | - | - | 1 | 2 | - | - | - | - | - | - | 3 | 0.20 |
| 101 | 25 | Nature | - | - | 3 | - | - | - | - | - | - | - | 3 | 0.20 |
| 102 | 25 | Sarhad J. Agn. | - | - | 1 | 1 | 1 | - | - | - | - | - | 3 | 0.20 |
| 103 | 25 | Indian J. of Genetic Plant Breeding | - | 1 | 2 | - | - | - | - | - | - | - | 3 | 0.20 |
| 104 | 25 | Plant Var Seeds | - | 3 | - | - | - | - | - | - | - | - | 3 | 0.20 |
| 105 | 25 | Indian J. of Animal Nutrition | - | 1 | - | - | - | - | - | 2 | - | - | 3 | 0.20 |
| 106 | 25 | American J. of Botany | - | - | 2 | 1 | - | - | - | - | - | - | 3 | 0.20 |
| 107 | 25 | J. of Environ. Quality | - | - | - | 1 | - | 1 | 1 | - | - | - | 3 | 0.20 |
| 108 | 25 | J. of Herdity | - | - | - | 1 | 1 | 1 | - | - | - | - | 3 | 0.20 |
| 109 | 25 | Zeitschrift Fuernaturforce | - | - | - | 1 | - | 1 | 1 | - | - | - | 3 | 0.20 |
| 110 | 25 | J. of Plant Research | - | - | - | 1 | 1 | 1 | - | - | - | - | 3 | 0.20 |
| 111 | 25 | Acta Botinica Sinica | - | - | - | - | 2 | - | - | - | - | 1 | 3 | 0.20 |
| 112 | 25 | Plant Cell Tissue & Organ | - | - | - | - | 1 | - | 1 | 1 | - | - | 3 | 0.20 |
| 113 | 25 | Phytone | 1 | - | - | - | - | - | - | 1 | 1 | - | 3 | 0.20 |
| 114 | 25 | Zeitschrift Fuerpflanzener nachrin & Bode | - | - | - | - | 1 | 2 | - | - | - | - | 3 | 0.20 |
| 115 | 25 | J. of Biochem. & Mol. Bio | - | - | - | - | 2 | 1 | - | - | - | - | 3 | 0.20 |
| 116 | 25 | Revista FA Sociedase | - | - | - | - | - | 1 | - | - | 1 | 1 | 3 | 0.20 |
| 117 | 25 | Hort Sci. | - | - | - | - | - | 1 | - | 2 | - | - | 3 | 0.20 |
| 118 | 25 | Genus& Genetics | - | - | - | - | - | - | - | 2 | - | 1 | 3 | 0.20 |
| 119 | 25 | Plant Food for Human Nutrition | - | - | - | - | - | - | - | 1 | 2 | - | 3 | 0.20 |
| 120 | 25 | Asian Austrialian J. of Animal Sci. | - | - | - | - | - | - | - | - | 2 | 1 | 3 | 0.20 |
| 121 | 25 | Plant Physiology & Biochem. | - | - | - | - | - | - | - | - | 2 | 1 | 3 | 0.20 |
| 122 | 25 | J. of Agri. Food & Chem. | - | - | - | - | - | - | - | - | - | 3 | 3 | 0.20 |
| 123 | 26 | Acta Phytopathologi a et E ntomologica | – | - | - | - | - | - | - | - | - | 2 | 2 | 0.13 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hungerica | | | | | | | | | | | | |
| 124 | 26 | Folia Entomologica Mexicana | - | - | - | - | - | - | - | 1 | - | 1 | 2 | 0.13 |
| 125 | 26 | Trends in plant Science | - | - | - | - | - | - | - | - | - | 2 | 2 | 0.13 |
| 126 | 26 | Agri. Water Management | - | - | - | - | - | - | - | - | 2 | - | 2 | 0.13 |
| 127 | 26 | Micro-biol. | - | - | - | - | - | - | - | - | 2 | - | 2 | 0.13 |
| 128 | 26 | J. of Basic microbiol | - | - | - | - | - | - | 2 | - | - | - | 2 | 0.13 |
| 129 | 26 | Envrn. Sci. & Tech. | - | - | - | - | - | - | - | 2 | - | - | 2 | 0.13 |
| 130 | 26 | Plant varieties and seeds | - | - | - | - | 1 | - | 1 | - | - | - | 2 | 0.13 |
| 131 | 26 | Seed Sci. Research | - | - | - | - | 1 | - | - | 1 | - | - | 2 | 0.13 |
| 132 | 26 | J. of Economy | - | - | - | - | - | 1 | 1 | - | - | - | 2 | 0.13 |
| 133 | 26 | Cytologia | - | - | - | - | 1 | 1 | - | - | - | - | 2 | 0.13 |
| 134 | 26 | Zeitschriff fuer pfian zenkran Kheiter | - | - | - | - | 1 | - | - | - | 1 | - | 2 | 0.13 |
| 135 | 26 | Envi. & Exp. Botany | - | - | - | - | 1 | - | 1 | - | - | - | 2 | 0.13 |
| 136 | 26 | Nippen Nogeikageates | - | - | - | - | 1 | - | - | 1 | - | - | 2 | 0.13 |
| 137 | 26 | Sbornik Jihoceska Univer. | - | - | 1 | - | 1 | - | - | - | - | - | 2 | 0.13 |
| 138 | 26 | Atmospheric Environ. | - | - | - | 1 | - | - | - | 1 | - | - | 2 | 0.13 |
| 139 | 26 | Phyto-protection | - | - | - | 2 | - | - | - | - | - | - | 2 | 0.13 |
| 140 | 26 | J. of Molecular Evaluation | - | - | - | - | 2 | - | - | - | - | - | 2 | 0.13 |
| 141 | 26 | RAD J. of Agri. Sci. upland & Industrial Crops | - | - | - | - | 2 | - | - | - | - | - | 2 | 0.13 |
| 142 | 26 | Revista De Ciencias | - | - | - | - | 2 | - | - | - | - | - | 2 | 0.13 |
| 143 | 26 | J. of Plant Biol | - | - | - | - | 2 | - | - | - | - | - | 2 | 0.13 |
| 144 | 26 | Genetic Resources & crop Evaluation | - | - | - | - | 1 | - | 1 | - | - | - | 2 | 0.13 |
| 145 | 26 | Indian Journal | - | - | 2 | - | - | - | - | - | - | - | 2 | 0.13 |
| 146 | 26 | Pak.J.of Scientific& Industrial Research | - | - | - | 2 | - | - | - | - | - | - | 2 | 0.13 |
| 147 | 26 | J. of Chem. Ecology | - | - | - | 2 | - | - | - | - | - | - | 2 | 0.13 |
| 148 | 26 | Acta socictatic Botanium Polonial | - | - | - | 1 | - | 1 | - | - | - | - | 2 | 0.13 |
| 149 | 26 | J. of Exp Botany Finland | - | - | - | 1 | - | - | - | - | - | 1 | 2 | 0.13 |
| 150 | 26 | J. of Applied Botany | - | - | - | - | - | 1 | - | 1 | - | - | 2 | 0.13 |
| 151 | 26 | Bio resources Tech | - | - | - | - | - | - | 2 | - | - | - | 2 | 0.13 |
| 152 | 26 | Soil Science | - | - | - | - | - | - | 1 | - | 1 | - | 2 | 0.13 |

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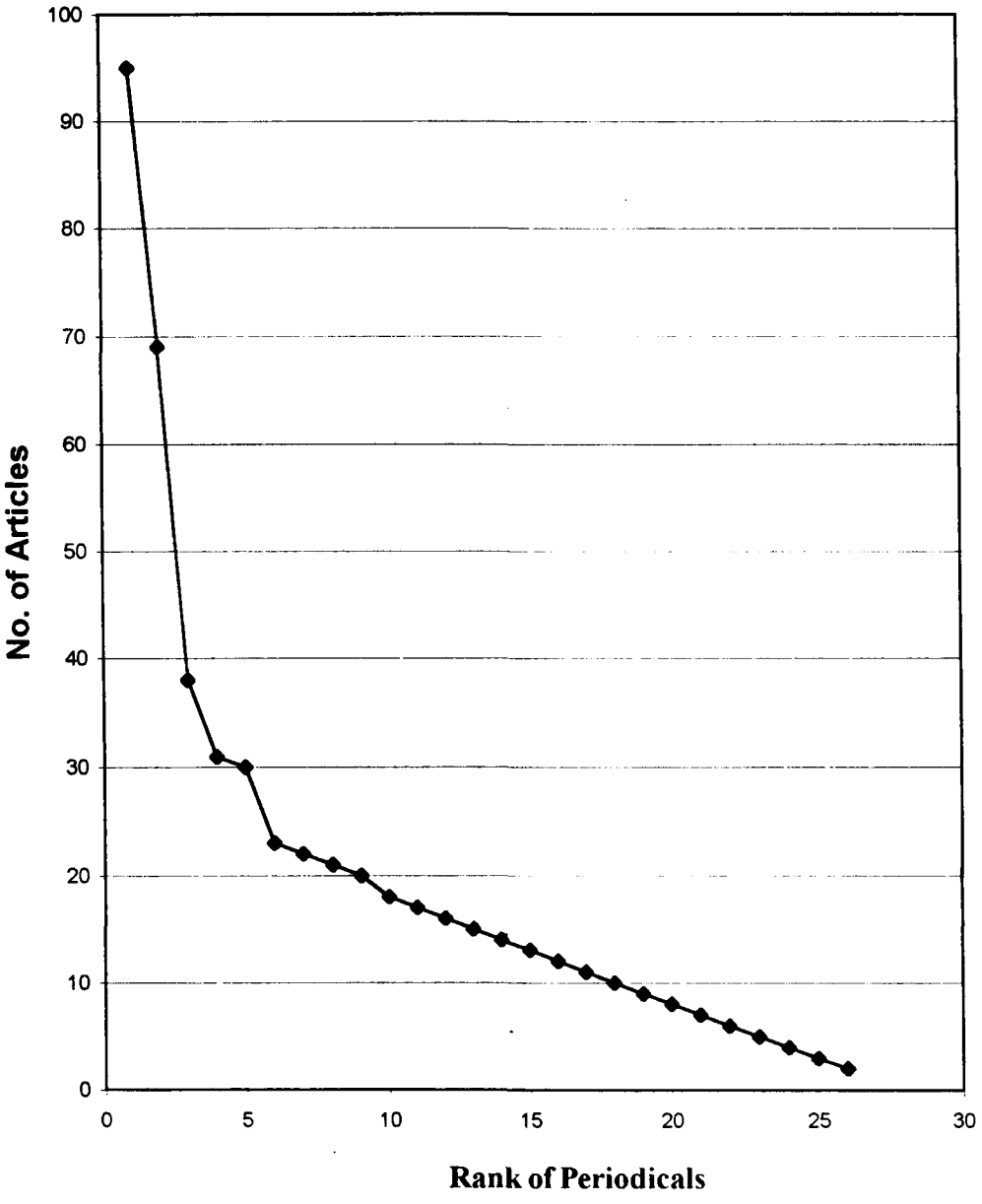
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Societies of American J | | | | | | | | | | | | |
| 153 | 26 | Canadian J of Animal Science | - | - | - | - | - | - | 2 | - | - | - | 2 | 0.13 |
| 154 | 26 | Canadian J. Agric Engg | - | - | - | - | - | - | 1 | - | 1 | - | 2 | 0.13 |
| 155 | 26 | Heredity | - | - | - | - | - | 1 | - | - | - | 1 | 2 | 0.13 |
| 156 | 26 | Soil use & Management | - | - | - | - | - | 2 | - | - | - | - | 2 | 0.13 |
| 157 | 26 | Sel'ko Khozy an tuemnaya | - | - | - | - | - | 1 | - | 1 | - | - | 2 | 0.13 |
| 158 | 26 | Plant J. | - | - | - | - | - | - | - | 2 | - | - | 2 | 0.13 |
| 159 | 26 | Acta Physiologiae Plantarum | - | - | - | - | - | 1 | - | - | 1 | - | 2 | 0.13 |
| 160 | 26 | Animals Feed Sci. & Technol. | - | - | - | - | - | 1 | 1 | - | - | - | 2 | 0.13 |
| 161 | 26 | Small Reminant Research | - | - | - | - | - | 2 | - | - | - | - | 2 | 0.13 |
| 162 | 26 | Molecular Plant Microbe Internet | - | - | 1 | - | - | 1 | - | - | - | - | 2 | 0.13 |
| 163 | 26 | Water air foil Pollut | - | - | 1 | 1 | - | - | - | - | - | - | 2 | 0.13 |
| 164 | 26 | Seed Research | - | - | 1 | 1 | - | - | - | - | - | - | 2 | 0.13 |
| 165 | 26 | J. Research punjab Agric Univ. | - | - | 1 | 1 | 1 | - | - | - | - | - | 2 | 0.13 |
| 166 | 26 | Pestic Bio Chem. Physiol | - | - | 1 | - | - | 1 | - | - | - | - | 2 | 0.13 |
| 167 | 26 | Crop Research | - | 1 | - | - | - | - | - | - | 1 | - | 2 | 0.13 |
| 168 | 26 | Cuba J. Agri Science | - | 2 | - | - | - | - | - | - | - | - | 2 | 0.13 |
| 169 | 26 | Australia J. Agric Res. | - | 1 | - | - | - | - | - | - | - | 1 | 2 | 0.13 |
| 170 | 26 | Canadian J. Botany | - | 1 | 1 | - | - | - | - | - | - | - | 2 | 0.13 |
| 171 | 26 | Indian J. Agri. | - | 1 | - | 1 | - | - | - | - | - | - | 2 | 0.13 |
| 172 | 26 | Chemosphere | - | 1 | - | - | - | 1 | - | - | - | - | 2 | 0.13 |
| 173 | 26 | Chemistry Papers | 2 | - | - | - | - | - | - | - | - | - | 2 | 0.13 |
| 174 | 26 | Korean Biochem. | 1 | - | 1 | - | - | - | - | - | - | - | 2 | 0.13 |
| 175 | 26 | J. of Indian Society Soil Sci. | 1 | - | - | 1 | - | - | - | - | - | - | 2 | 0.13 |
| 176 | 26 | Plant Cell Physiol | 1 | 1 | - | - | - | - | - | - | - | - | 2 | 0.13 |
| 177 | 26 | Indian J. of Bio Chem.& Biophy. | 1 | 1 | - | - | - | - | - | - | - | - | 2 | 0.13 |
| 178 | 26 | Biotech letters | 2 | - | - | - | - | - | - | - | - | - | 2 | 0.13 |
| 179 | 26 | Planta system Evaluation | 1 | - | - | - | - | - | 1 | - | - | - | 2 | 0.13 |
| Others Periodicals | | | | | | | | | | | | | | 200 |

## Rank of Periodical



## COUNTRYWISE DISTRIBUTION

This Table-6 shows the countrywise distribution 1440 Articles where dispressed 55 countries. The USA is the most productive country. It has published 362 Articles during the period of 1991-2000 (i.e. 25.1%) of the total productivity. It has Rank 1st.

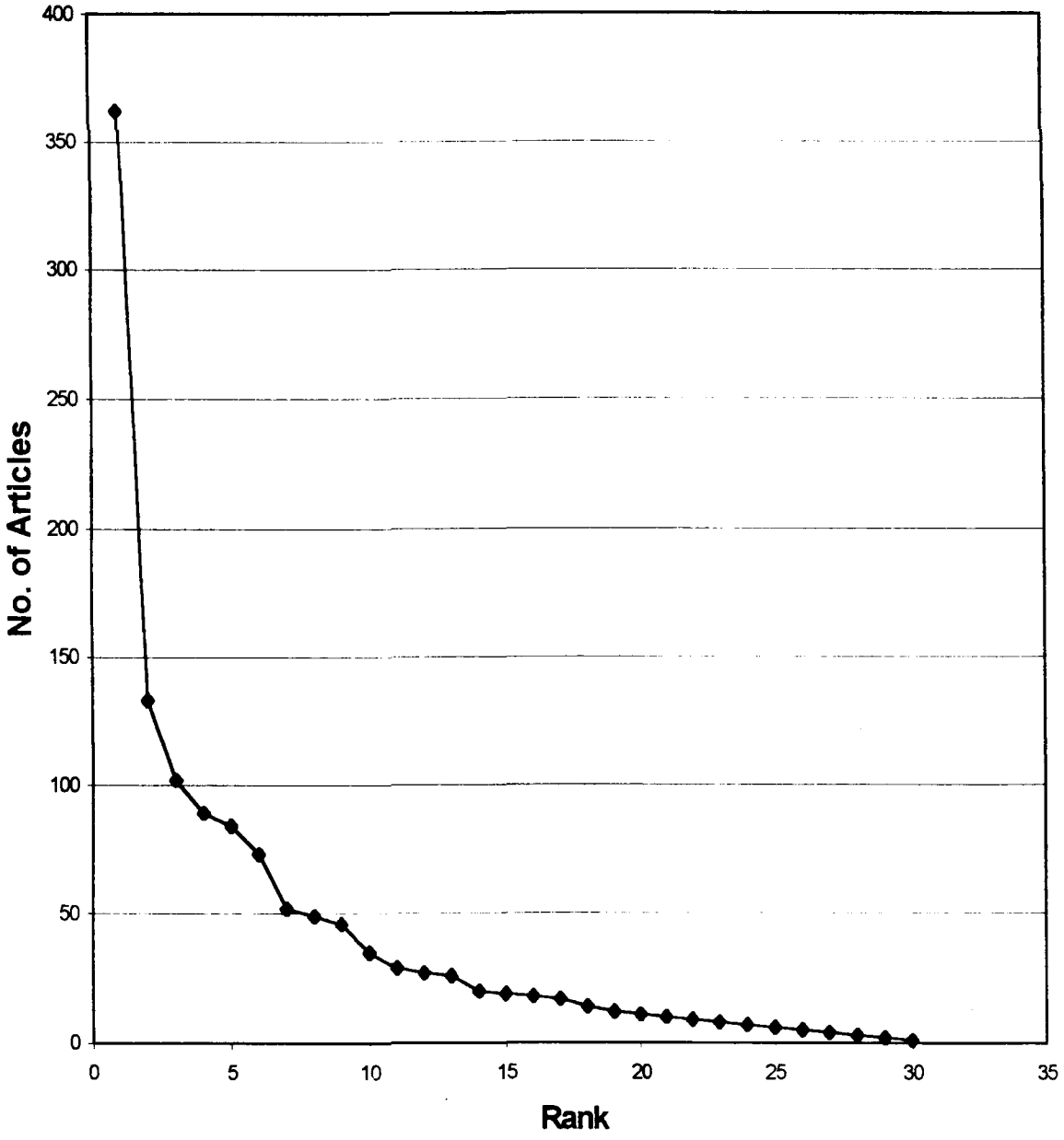
The second Ranked country is CANADA, it published 133 Articles (i.e 9.23%) of the total productivity and third ranked country is U.K., it published 102 articles (i.e. 7.08%) of the total Productivity. The countries are arranged according to decreasing productivity of articles. 12 countries published only two article during the period of 1991-2000.

**TABLE - 6**

| S. No | Rank | Name of Country | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | USA | 39 | 33 | 46 | 51 | 47 | 42 | 35 | 11 | 36 | 22 | 362 | 25.1% |
| 2 | 2 | CANADA | 14 | 9 | 15 | 20 | 17 | 14 | 13 | 11 | 12 | 8 | 133 | 9.23% |
| 3 | 3 | UK | 10 | 10 | 12 | 10 | 10 | 7 | 15 | 7 | 10 | 11 | 102 | 7.08% |
| 4 | 4 | GERMANY | 4 | 9 | 15 | 9 | 10 | 13 | 9 | 9 | 4 | 7 | 89 | 6.18% |
| 5 | 5 | INDIA | 15 | 17 | 8 | 9 | 6 | 8 | 5 | 5 | 9 | 7 | 84 | 5.83% |
| 6 | 6 | AUSTRALIA | 11 | 13 | 3 | 10 | 12 | 8 | 3 | 8 | 1 | 4 | 73 | 5.06% |
| 7 | 7 | JAPAN | 7 | 5 | 3 | 7 | 8 | 6 | 3 | 7 | 3 | 3 | 52 | 3.61% |
| 8 | 8 | SPAIN | 10 | 8 | 5 | 4 | 6 | 4 | 4 | 3 | 2 | 3 | 49 | 3.40% |
| 9 | 9 | FINALAND | 9 | 3 | - | 5 | 3 | 7 | 6 | 2 | 7 | 4 | 46 | 3.19% |
| 10 | 10 | FRANCE | 10 | 3 | 3 | 2 | 1 | 1 | 4 | 2 | 4 | 5 | 35 | 2.43% |
| 11 | 11 | ARGENTINA | 2 | 2 | 1 | 10 | 4 | - | 2 | 2 | 2 | 4 | 29 | 2.01% |
| 12 | 11 | ITALY | 3 | 3 | 4 | 3 | 2 | 2 | 5 | 1 | 5 | 1 | 29 | 2.01% |
| 13 | 12 | RUSSIA | 10 | 2 | 2 | 3 | 2 | 1 | 1 | 4 | 1 | 1 | 27 | 1.87 |
| 14 | 13 | BRAZIL | 2 | - | 2 | - | 3 | 4 | 5 | 4 | 4 | 2 | 26 | 1.80% |
| 15 | 14 | S. AFRICA | 4 | 2 | 4 | 1 | 2 | 3 | 2 | - | 1 | 1 | 20 | 1.38% |
| 16 | 15 | NEWZEALAND | 7 | 4 | - | 2 | 1 | 1 | - | 2 | 1 | 1 | 19 | 1.31% |
| 17 | 16 | NORWAY | 1 | 1 | 3 | 4 | 3 | 3 | 1 | - | 2 | - | 18 | 1.25% |
| 18 | 16 | SWEDAN | 4 | 1 | - | 2 | - | 4 | - | 3 | - | 4 | 18 | 1.25% |
| 19 | 17 | POLAND | 3 | 2 | 3 | 1 | 2 | 3 | - | - | 2 | 1 | 17 | 1.18% |
| 20 | 18 | SWIZERLAND | 4 | - | 1 | 7 | 1 | - | 1 | - | - | - | 14 | 0.97% |
| 21 | 18 | S. KOREA | 3 | 1 | - | - | 7 | - | 1 | 1 | 1 | - | 14 | 0.97% |
| 22 | 19 | PORTGUE | 2 | 2 | - | 3 | 2 | - | - | 3 | - | - | 12 | 0.83% |
| 23 | 20 | MAXICO | 3 | 2 | 1 | 1 | - | 1 | - | 1 | - | 2 | 11 | 0.76% |
| 24 | 20 | NETHERLAND | 2 | 3 | 1 | 1 | 2 | - | 1 | - | 1 | - | 11 | 0.76% |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 21 | UKRAIN | 4 | - | 1 | 1 | 1 | - | 2 | 1 | - | - | 10 | 0.69% |
| 26 | 21 | CHINA | 2 | - | 3 | - | 1 | 1 | - | 3 | 1 | 1 | 10 | 0.69% |
| 27 | 21 | CHILE | 2 | 3 | 1 | - | - | - | 1 | 1 | 2 | - | 10 | 0.69% |
| 28 | 22 | CZERPUBLIC | - | - | 2 | 2 | 1 | 2 | - | - | 1 | 1 | 9 | 0.62% |
| 29 | 22 | GREECE | 2 | 4 | - | 1 | 1 | - | 1 | - | - | - | 9 | 0.62% |
| 30 | 22 | PAKISTAN | - | 1 | - | 2 | 4 | 2 | - | - | - | - | 9 | 0.62% |
| 31 | 23 | DENMARK | 1 | 1 | - | 2 | - | 3 | - | - | - | 1 | 8 | 0.55% |
| 32 | 23 | ISRAIL | 2 | - | 1 | - | - | 2 | - | 3 | - | - | 8 | 0.55% |
| 33 | 23 | ALGERIA | 2 | 4 | - | - | - | - | - | - | 1 | 1 | 8 | 0.55% |
| 34 | 24 | HUNGRY | 2 | 1 | 1 | 1 | - | - | 1 | - | - | 1 | 7 | 0.48% |
| 35 | 25 | BELARUS | - | 1 | - | 3 | - | 1 | - | - | - | - | 6 | 0.41% |
| 36 | 25 | CUBA | 4 | - | - | - | 1 | - | - | - | 1 | - | 6 | 0.41% |
| 37 | 26 | ETHOPIA | 1 | 2 | - | - | - | 1 | - | - | 1 | - | 5 | 0.34% |
| 38 | 27 | TURKEY | 2 | - | 1 | - | - | - | - | 1 | - | - | 4 | 0.27% |
| 39 | 27 | EGYPT | 2 | - | - | 1 | 1 | - | - | - | - | - | 4 | 0.27% |
| 40 | 27 | AUSTRIA | 1 | 1 | - | - | - | 1 | - | - | 1 | - | 4 | 0.27% |
| 41 | 27 | URBANA | 1 | - | - | 1 | - | - | - | - | 1 | 1 | 4 | 0.27% |
| 42 | 28 | BELGIUM | 1 | - | 1 | - | - | 1 | - | - | - | - | 3 | 0.20% |
| 43 | 28 | VENEUZELLA | - | 1 | - | 1 | - | - | - | 1 | - | - | 3 | 0.27% |
| 44 | 29 | MOROCO | - | - | - | - | 1 | - | - | 1 | - | - | 2 | 0.13% |
| 45 | 29 | JORDON | - | 1 | - | - | - | - | 1 | - | - | - | 2 | 0.13% |
| 46 | 29 | YOUGOSLAVIA | 1 | - | - | - | 1 | - | - | - | - | - | 2 | 0.13% |
| 47 | 29 | SLOMANIA | 1 | 1 | - | - | - | - | - | - | - | - | 2 | 0.13% |
| 48 | 29 | MALAYSIA | - | 1 | - | - | 1 | - | - | - | - | - | 2 | 0.13% |
| 49 | 29 | SRILANKA | - | - | 1 | - | - | 1 | - | - | - | - | 2 | 0.13% |
| 50 | 29 | BUSRAH | - | 1 | - | - | - | - | 1 | - | - | - | 2 | 0.13% |
| 51 | 29 | IRELAND | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 | 0.13% |
| 52 | 29 | KUWAIT | - | - | 1 | 1 | - | - | - | - | - | - | 2 | 0.13% |
| 53 | 29 | CROATIA | - | - | - | 1 | - | - | - | - | - | - | 2 | 0.13% |
| 54 | 29 | CYPRUS | 1 | - | - | - | - | - | - | 1 | - | - | 2 | 0.13% |
| 55 | 30 | ROMANIA | - | - | 1 | - | - | - | - | - | - | - | 1 | 0.06% |

## Rank of Country



## LANGUAGEWISE DISTRIBUTION

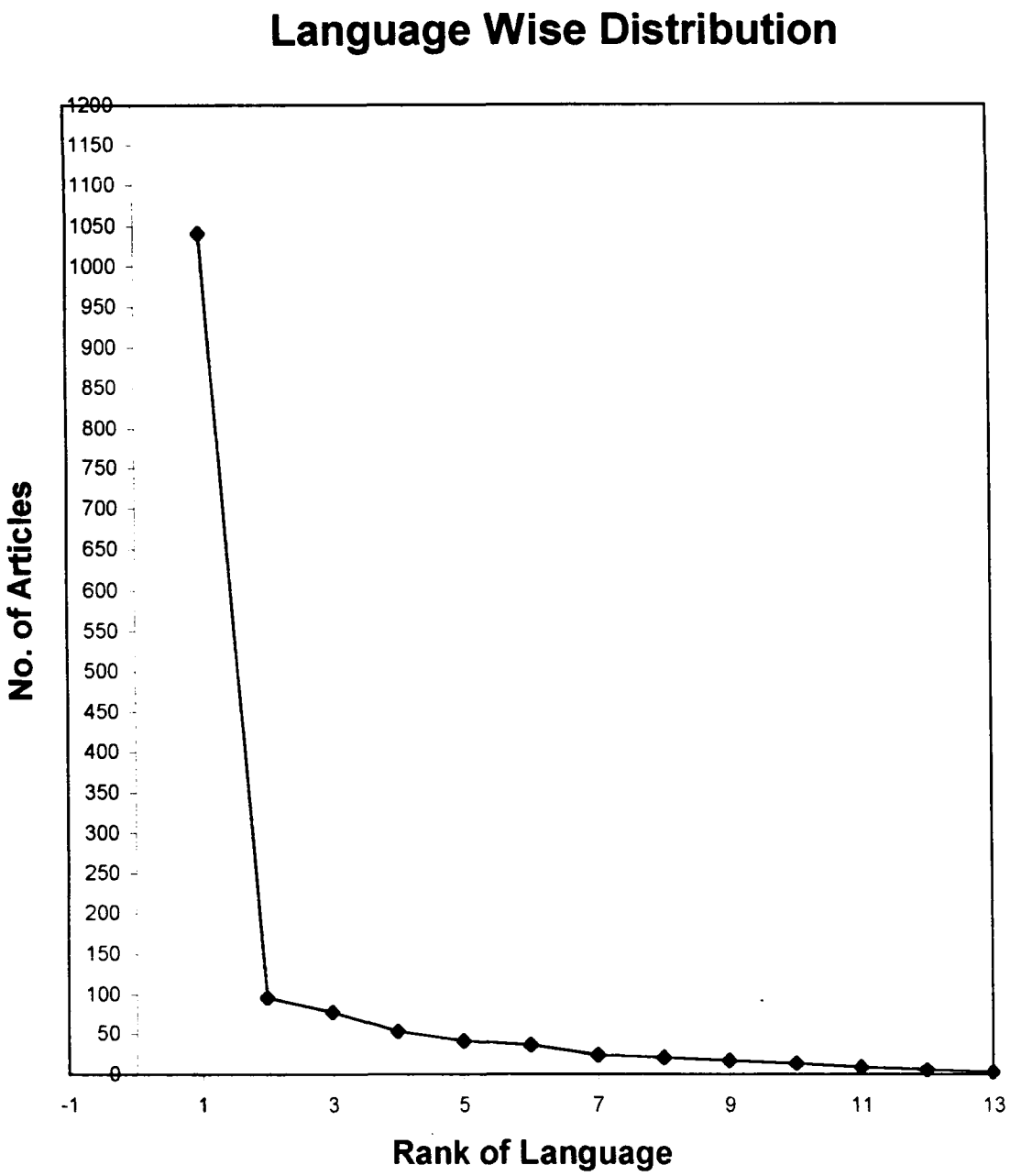
This table-7 shows the language wise distribution 1440 articles were dispersed among 14 different language over 10 years period, 1991-2000.

1041 articles published in the English language i.e. 72.2% of the total publication. The English language has I rank.

The German language published 96 articles i.e. 6.66% of the total production. It has the second rank in the language table. The third rank is of the French language, 77 articles were published in this language i.e. 5.3% of the total production others of decreasing productivity in the language table.

## TABLE -7

| S. No | Rank | Lang-uage | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | ENGLISH | 158 | 122 | 97 | 97 | 112 | 112 | 79 | 104 | 89 | 71 | 1041 | 72.2% |
| 2 | 2 | GERMAN | 8 | 13 | 16 | 12 | 5 | 15 | 8 | 8 | 5 | 6 | 96 | 6.6% |
| 3 | 3 | FRENCH | 8 | 7 | 15 | 14 | 16 | 5 | 5 | 2 | 2 | 3 | 77 | 5.3% |
| 4 | 4 | JAPANIES | 6 | 3 | 5 | 9 | 7 | 5 | 5 | 6 | 4 | 3 | 53 | 3.6% |
| 5 | 5 | RUSSIAN | 12 | 3 | 4 | 5 | 4 | 3 | 2 | 4 | 4 | - | 41 | 2.8% |
| 6 | 6 | SPANISH | 4 | 5 | 2 | 6 | 5 | 4 | 3 | 6 | - | 1 | 36 | 2.5% |
| 7 | 7 | PORT. | 1 | 1 | - | 6 | 2 | 1 | 3 | 6 | 2 | 1 | 23 | 1.5% |
| 8 | 8 | CHINES | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 6 | - | 1 | 21 | 1.4% |
| 9 | 9 | ROMAN | 1 | 2 | 4 | 1 | 1 | 2 | 3 | 1 | 2 | - | 17 | 1.1% |
| 10 | 10 | KOREAN | 3 | 1 | - | - | 6 | 1 | 1 | 1 | 1 | - | 14 | 0.9% |
| 11 | 11 | CZECH. | 1 | - | - | 2 | 3 | 1 | - | 1 | - | 1 | 9 | 0.6% |
| 12 | 12 | SWEDISH | 3 | - | - | 1 | - | - | - | 2 | - | - | 6 | 0.4% |
| 13 | 13 | HUNGAREAN | - | - | - | - | 1 | - | 1 | - | - | 1 | 3 | 0.2% |
| 14 | 13 | UKR | 1 | 1 | - | - | - | 1 | - | - | - | - | 3 | 0.2% |
| | | | | | | | | | | | | | 1440 | |


Language Wise Distribution
No. of Articles
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-1
1
3
5
7
9
11
13
Rank of Language

## LEVEL-2

**Citation analysis:-**

The primary function of citation is to provide connection between two documents, one which cites and the other which is cited." There are number of reason for giving citations. Weignstock Lietz, Moravesik, and Murugesan, hodges, Oppenheim and Ren, Finney, Frost and Thorme have all attempted to explore the possible reasons for giving citations. They include the positive and negative reasons for inclusion. However, it has to be conceded that if the reasons is positive, there is bound to have some connection between the citing and cited paper. The first recorded analysis was a study by P.L.K. Gross and E.M. Gross published in 1927 in order to determine the journals to be subscribed to and the back volumes to be acquired for the Library of the Pomona College. They studied the citation frequency in the references given in the Journal of the American Chemical Society. Citation analysis is very often fruitfully applied to derive the following benefit:

**(a) To lead the reader to further studies in the field:-**

This is perhaps, the primary purpose of citations. Readers can verify the correctness of the correctness of the information and thereby convince themselves.

(b) **For the preparation of Bibliographies:-** The first use of citation indexing was made in Shepherd's Citations published in 1873. This technique of citation of indexing has been perfected by Eugene Grafield and other since then early 1960s. It is a fact that compilation of bibliographers in new field is really difficult. In such circumstances, analysis of citations of article may be the only way together information. The very fact that the citation have been verified, evaluated and recommended by authors who are experts in their own filed make them all the more acceptable for inclusion in a bibliography.

(c) ***To study the use pattern of different type of documents:-*** Citations may be if books, journal articles, report, standards thesis/dissertations etc. the relative use of each of the these type can be ascertained based on the frequency of citations. For example, various citations studies have shown that journal articles are the most preferred source consulted by scientists since they constitute about 70-80% of the total citations. Similarly citation practices among social scientists indicate that they give equal importance to books and journals.

(d) ***To find out the relative use of different languages:-***

Since English has emerged as a world language, especially in science and technology, there is a predominance of English language publications in

all branches. This can easily be understood from citation analysis. In the mid-sixties, for instance, the share of English language papers in Mathematics and Chemistry was more than 50 percent. Russian occupied the second position with about 20 percent followed by German and French.

Citation practices have also shown that the relative amount of literature in different subjects produced by different countries changes with time. It has been observed that German has declined very much in the $20^{th}$ century: especially in the field of Chemistry where publications in this language reigned supreme.

(d) **To study the use of literature from different countries:-** From the citations, the country of their origin can be identified in all types of materials like journal article, books, reports etc. In many subject areas. U.S. Publications are found to be used more heavily. In medicine, biochemistry, physiology and pharmacology, Sengupta had identified the leading role played by U.S. Journal. Journals of U.K. occupied the second position, but they come any where near their American counterparts in the frequency of use. Similarly, Martyn and Gilchrist had found that Indian publications are also equally cited in certain subjects.

(e) **To study the scattering of subjects**:- Studies about the dispersion or scatting of subject in different sources as evidenced by citation analysis have brought out interesting results. For example,

i. Social science and art subjects show a wider scatter of publications than the science.

ii. Research publications in technology show greater dispersion than those in science.

iii. A new branch of science, especially an interdisciplinary one, shown a greater dispersion than an older branch of science.

iv. There can be differences in scatter between sub-field within a subject as also among major subjects.

v. The rate of scatter within the same subject alters with time. Meadows jas summarized these findings

(f) ***To decide the observances rate of documents in different subjects:-*** Citations in subsequent literature and usage pattern in libraries are considered as two indicators of the obsolescence of literature. Analysis of citations by age of the cited document can shown the useful life of a document. In order to measure the decay or obsolescence rate of documents, the concepts of 'half life' has been borrowed from Nuclear Physics. Using this measure Burton and Kebler had suggested a range of half-lives for different subjects. The fast growing subjects would have lesser half lives compared to established disciplines. The above study had shown the half-life of Metallurgical Engineering as 3.9 while that of Botany is 10 years.

These time scales are highly useful in the planning of library holdings.

(g) ***To determine the interdependence and lineage of subjects***:- The interdependence of basic and applied field can be understood by citation studies. Establishment of this interdependence can be of use in the acquisition centres. The analysis of citations of citations, of the Annual Review of Medicine for the years 1965-69 b I.N. Sengupta has established the contribution made by journal in the field of biochemistry and physiology to the medical research. Further studies by him have brought to light the mutual contribution of biochemistry, Physiology and microbiology.

As far as lineage of subject are concerned. Garfield's experiments in citation indexes have very much contributed in mapping the history of many of them.

(i) ***To prepare ranked list of periodicals***:- Ranked list of periodicals can be prepared by two methods:

1. by actual citation counting: and
2. by counting the number of entries in indexing and abstracting periodicals. In the first method, information is collected from the references cited in source articles. By studying the average number of citations, one ca develop a list of cited journal in the ranked order.

In the second method, the number of items contributed by different periodicals during a period of time is calculated from the secondary source and the ranked lists are very often used as guidelines in the accusation of periodicals and other materials in the library.

(h) ***To study the rate of collaborative research***:- Collaborative research can be effectively measured from the number of authors in papers. Such studies can be conducted to understand global trends, national trends or trends in different subject. Studies in this direction have indicated that collaboration varies from discipline to discipline, within the same discipline from to time, and from country to country. However, the extent of collaboration may not be revealed from the citations. Effort in this direction have been made by Ajiferuke et al who have attempted to define good collaboration measures.

(k) ***For the analysis of scientific journal***:- Citation analysis provides a number interesting and useful insight into the networking of journal. These insights are developed from different citation measure which are perfected by Institute for Scientific Information (ISI)

(i) ***Citation rate of a journal***: This is the number of times a journal has been cited. It can consist of all the reference to the cited journal counting even duplicate reference from the same source article as a separate citation. It can also the calculated by counting only the number of source articles that cited the journal. A third method of

calculating citation rate that is followed by ISI is by counting the number of reference to the cited journal, but treating duplicate reference from the same source article as only a single citation link.

(ii) ***Impact factor***:- Impact Factor (IF) is the average citation rate of a journal's articles. It is basically a ratio between the rate of the journal and its citation potential. Citatin rate is defined as the number of citable items published.

Therefore IF = the number of times a journal was cited/the number of citable items the journal published.

Previously. It was not possible to calculate the IF of journals not covered by Science Citation Index. But now a new formula for the determination of IF for journals which are not incorporated in it has been worked out by B.K. Sen and Journal of Documentation. 45 (2) 1989.

*iii* ***Self-citing rate:-*** This is a measurement of the frequency with which journal's reference and cited articles it published,

vi. ***Self cited rate:-*** This again, is a measurement of self-citation. It shows what percentage of citations recovered by a journal by a journal originated in articles published by the journal. These self-citation rates serve as indexes to the newness, size and isolation of the intellectual universe in which a journal operates.

vi. ***Immediacy index:-*** This is method of showing how rapidly the material published by journal are picked up and used. It is calculated

by the number of citations received by articles in journal during. The year in which they were published.

The results of the citation measure carried out by ISI are published regularly in the Journal Citation Reports (JCR) of ISI. Citation counts have also been stretched even to measure the productivity in other areas As Broadus points out, "Over the last two decades, tabulation of citations have been used to measure the importance of academic departments, but especially of individual scholars and the contributions they made to their respective fields" 56. In addition to the above areas of application, citation analysis has also led to the development of such concept like bibliographic coupling put forward by kessler and co-citation is getting renewed attention now-a-day s.

**Citation analysis in the primary function is provide. " a connection between two documents. One which cites and the other which in cited". The citation links provide a quantitative picture of the journal utility and relationship that are useful in many ways, the conclusion are mainly based on what scientist say about the utility and relationship in their choice of reference. These varies according to the function of the journals.**

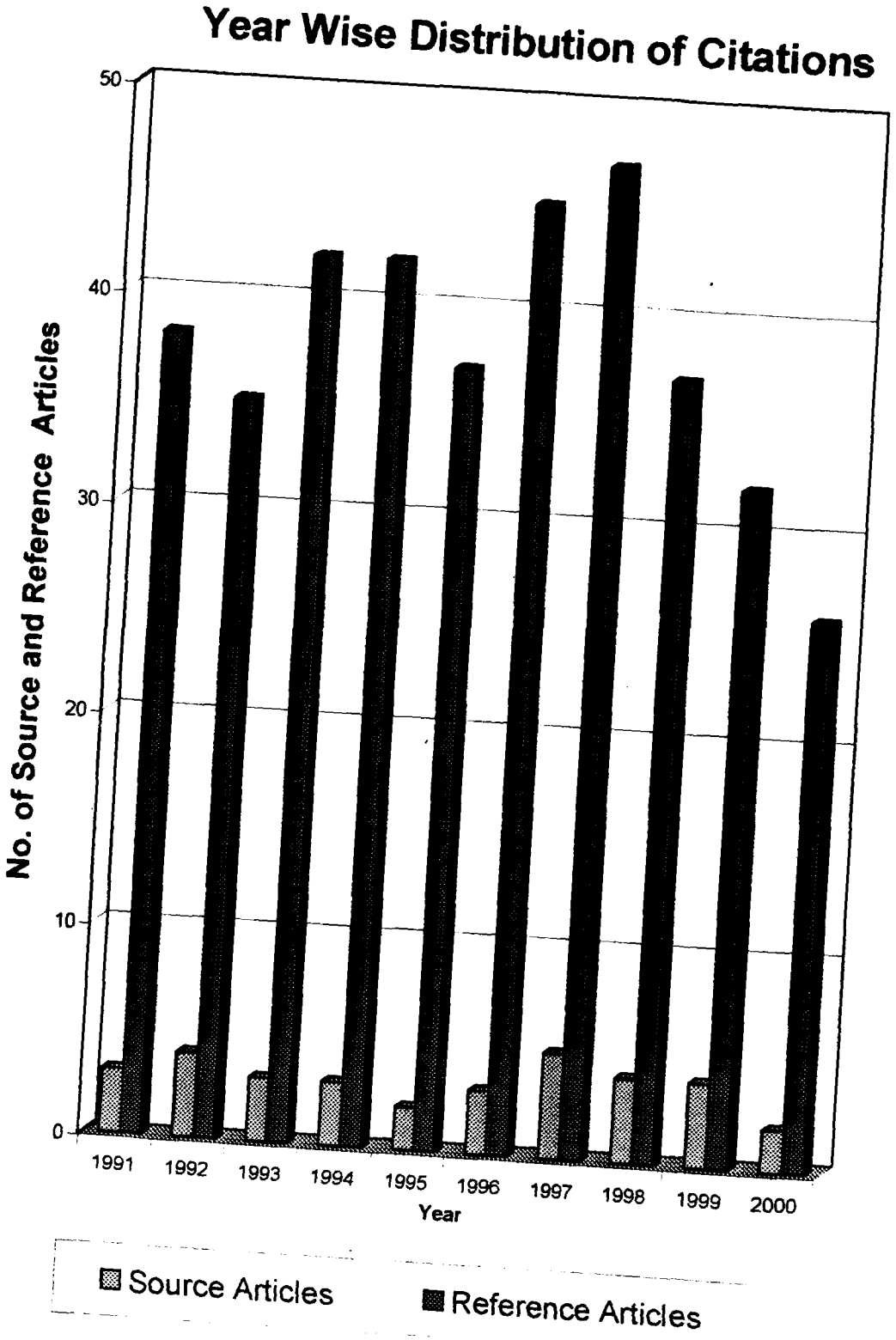
## Yearwise Distribution

Table-8 shows the year distribution of the citations during the period of 1991-2000 in this table source articles (as the sample) are taken from the issues of major journals which are available in the department of Botany, AMU on the basis of source articles. Article references are noted from the journals articles. The year 1997 shows the maximum number of reference articles.

Where as the year 1999 shows the minimum numbers of references articles.

**TABLE - 8**

| S.No. | Year | No. of Source Articles | No. of Ref. Articles | Percentage (%) | Average |
|---|---|---|---|---|---|
| 1 | 1991 | 3 | 38 | 9.97 | 14 |
| 2 | 1992 | 4 | 35 | 9.18 | 8.75 |
| 3 | 1993 | 3 | 42 | 11.0 | 14 |
| 4 | 1994 | 3 | 42 | 11.0 | 14 |
| 5 | 1995 | 2 | 37 | 9.71 | 18.5 |
| 6 | 1996 | 3 | 45 | 11.8 | 22.5 |
| 7 | 1997 | 5 | 47 | 12.3 | 9.4 |
| 8 | 1998 | 4 | 37 | 9.71 | 9.25 |
| 9 | 1999 | 4 | 32 | 8.3 | 8.0 |
| 10 | 2000 | 2 | 26 | 6.8 | 13 |
| **Total** | | **33** | **381** | | |

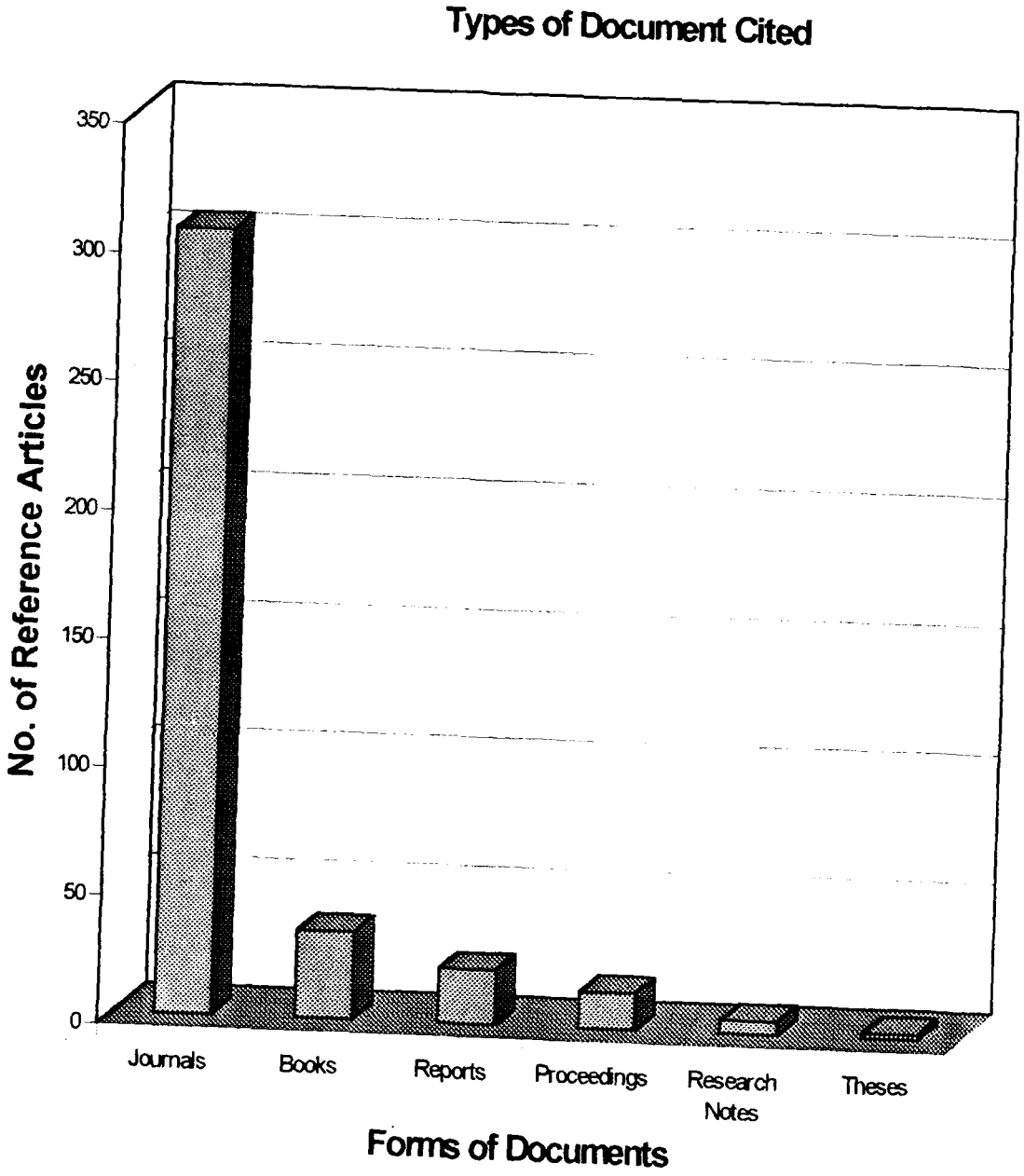

Year Wise Distribution of Citations
No. of Source and Reference Articles
50
40
30
20
10
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Year
Source Articles
Reference Articles

## TYPES OF DOCUMENT CITED

The table-9 shows the forms of document cited. Reference articles obtained were analysed in detail after analysing it is found that journals are the most dominant form of documents which were cited. It is given rank Ist. The IInd rank is given to book. The III rank is of reports and IV rank is of proceedings.

### TABLE - 9

| S No | Rank | Forms of documents | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Journals | 41 | 32 | 35 | 28 | 30 | 17 | 42 | 38 | 20 | 22 | 305 | 80.0 |
| 2 | 2 | Books | 3 | 5 | 6 | 5 | 4 | 3 | 3 | 2 | 1 | 2 | 34 | 8.9 |
| 3 | 3 | Reports | 2 | 1 | 2 | - | 3 | 4 | 2 | 3 | 1 | 3 | 21 | 5.5 |
| 4 | 4 | Proceedings | 1 | 2 | 1 | - | 2 | 1 | 2 | 1 | 1 | 3 | 14 | 3.6 |
| 5 | 5 | Research notes | 1 | - | - | 2 | - | 1 | - | 1 | - | - | 5 | 1.3 |
| 6 | 6 | Thesis | - | - | - | 1 | - | 1 | - | - | - | - | 2 | 0.5 |
| | | | | | | | | | | | | | | |

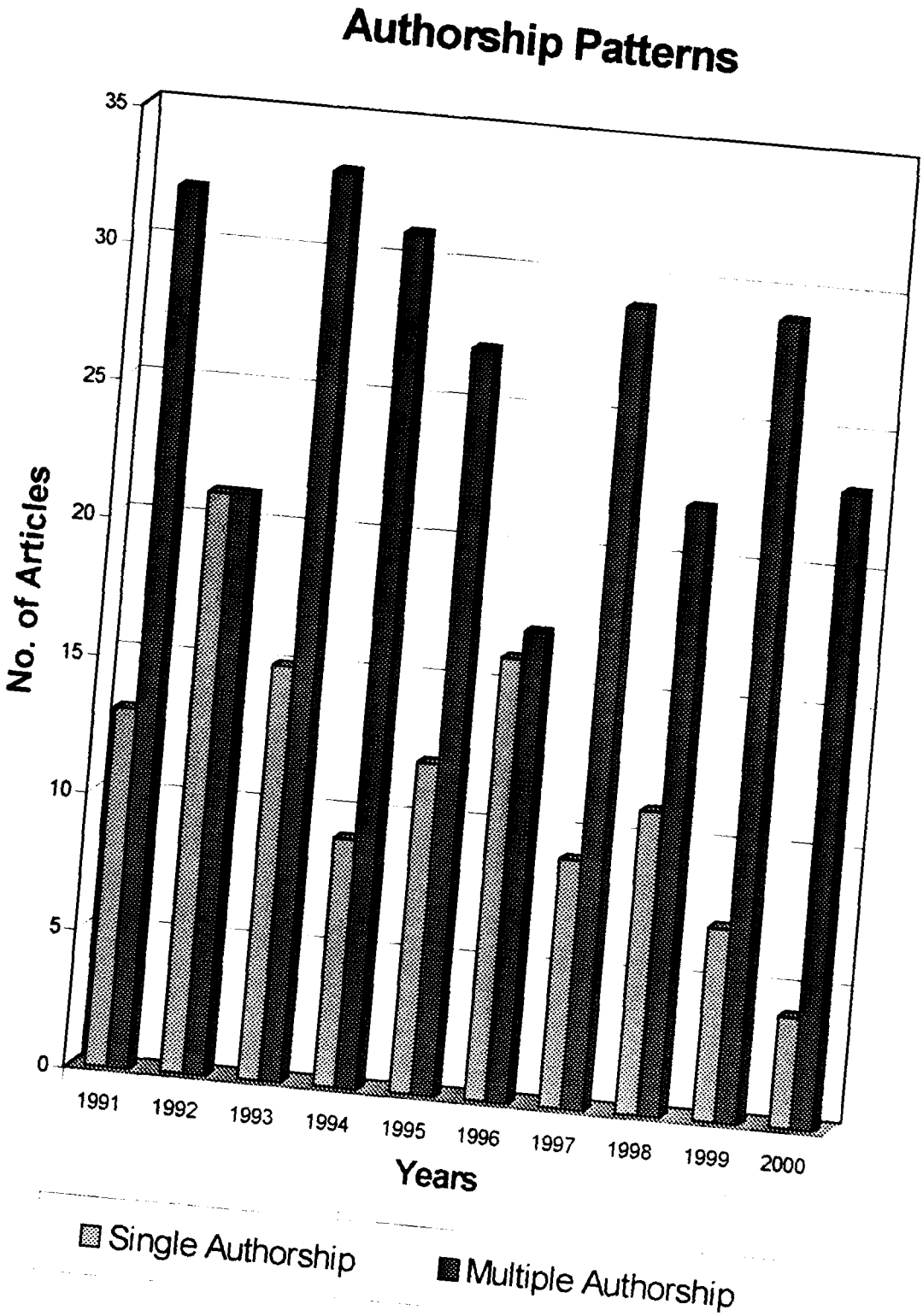

Types of Document Cited
No. of Reference Articles
350
300
250
200
150
100
50
0
Journals
Books
Reports
Proceedings
Research Notes
Theses
Forms of Documents

## AUTHORSHIP PATTERN

Analysis of data in table 10 shows that out of 381 cited articles 117 articles (30.70%) are single authorship and remaining 264 articles (69.29%) are or multiple authorship. The percentage of single authorship is maximum in 1992 and minimum in 1994 and 1997. Similarly multiple authorship is minimum 1996 (6.43%).

**TABLE -10**

| S.No. | Year | Single authorship | % | Multiple authorship | % |
|---|---|---|---|---|---|
| 1 | 1991 | 13 | 11.1 | 32 | 12.1 |
| 2 | 1992 | 21 | 17.9 | 21 | 7.95 |
| 3 | 1993 | 15 | 12.8 | 33 | 12.5 |
| 4 | 1994 | 9 | 7.6 | 31 | 11.7 |
| 5 | 1995 | 12 | 10.2 | 27 | 10.2 |
| 6 | 1996 | 16 | 13.6 | 17 | 6.43 |
| 7 | 1997 | 9 | 7.6 | 29 | 10.9 |
| 8 | 1998 | 11 | 9.4 | 22 | 8.3 |
| 9 | 1999 | 7 | 5.98 | 29 | 10.9 |
| 10 | 2000 | 4 | 3.41 | 23 | 8.7 |
| Total | | 117 | | 264 | |


Authorship Patterns
No. of Articles
35
30
25
20
15
10
5
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
Years
Single Authorship
Multiple Authorship

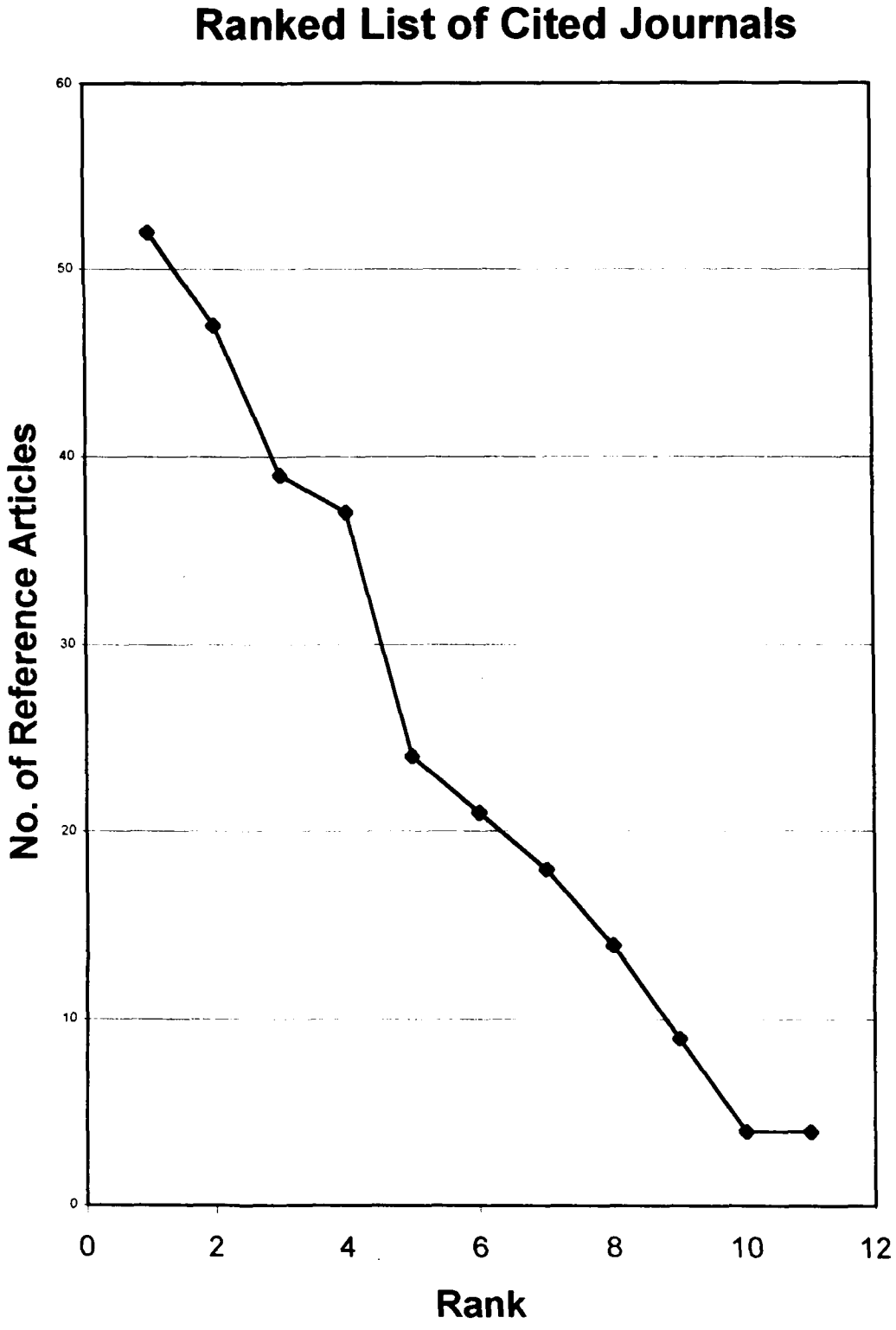
## RANKED LIST OF CITED JOURNALS

Table-11 shows the ranking of cited journal during the period of 1991-2000. After analysing in detail journal of Crop Science is given rank Ist which has also obtained rank I in the Ist level study.

Its frequency is 52 articles (17.0%). The II rank periodical is Planta i.e. 47 articles (15.4%). It has obtained rank 5th in the Ist level study. The IIIrd rank periodical is Plant Disease in 39 articles (12.7%), which has obtained rank 7 in the Ist level study.

**TABLE -11**

| S .NO | Rank | Periodicals | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Crop Science | 10 | 5 | 3 | 6 | 4 | 5 | 7 | 3 | 4 | 5 | 52 | 17.0 |
| 2 | 2 | Planta | 6 | 6 | 7 | 4 | 3 | 5 | 3 | 3 | 7 | 3 | 47 | 15.4 |
| 3 | 3 | Plant Disease | 8 | 2 | 4 | 3 | 3 | - | 9 | 2 | 3 | 5 | 39 | 12.7 |
| 4 | 4 | Plant Cell Physiol | 2 | 7 | - | 6 | 5 | 1 | 4 | 5 | 4 | 3 | 37 | 12.1 |
| 5 | 5 | New Pathologist | 1 | 5 | - | 2 | 4 | 2 | 2 | 2 | 4 | 2 | 24 | 7.8 |
| 6 | 6 | J. of Ex. Botany | 2 | - | 3 | - | - | 2 | 5 | 4 | 5 | - | 21 | 6.8 |
| 7 | 7 | Euphytica | 2 | - | 3 | - | 2 | 4 | 5 | 1 | 1 | - | 18 | 5.9 |
| 8 | 7 | Plant Pathology | 1 | 1 | 2 | - | 3 | 2 | 3 | 4 | - | 2 | 18 | 5.9 |
| 9 | 7 | Phyto Chemistry | - | - | - | 7 | 1 | 1 | 2 | 1 | 5 | 1 | 18 | 5.9 |
| 10 | 8 | J. of Agri Research | 3 | 1 | 2 | 1 | 2 | - | - | 5 | - | - | 14 | 4.5 |
| 11 | 9 | The Plant Cell | 1 | - | - | 2 | 2 | 3 | - | 1 | - | - | 9 | 2.9 |
| 12 | 10 | Plant Physiol | - | - | 1 | - | 1 | - | 2 | - | - | - | 4 | 1.3 |
| 13 | 10 | Plant Cell Environ | 1 | - | - | - | - | - | 1 | 1 | 1 | - | 4 | 1.3 |


Ranked List of Cited Journals
No. of Reference Articles
60
50
40
30
20
10
0
0
2
4
6
8
10
12
Rank

## RANKED LIST OF CITED AUTHORS

A rank list of cited authors has been prepared. It shows that which author is most frequently cited in the research of Avena Sativa for the period of 1991-2000.

Acco16rding to the table most cited author is YOUN (HYE-WON), who contributed 34 papers. The rank of this author is I. This author correlate with the author study of the Ist level, which has obtained rank 2 in the Ist level.

MCIFAN ® obtained rank IInd in second level and rank 5 in the Ist level. The IIIrd rank author is OMEMADA (M). contributed 18 cited papers.

**TABLE-12**

| S .NO | Rank | Periodicals | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | YOUN (HYE-WON) | 5 | 4 | 4 | 4 | 3 | 3 | 4 | 5 | 2 | - | 34 |
| 2 | 2 | MCLEAN (R) | 1 | 2 | 1 | 1 | 3 | 2 | - | 3 | 2 | 5 | 20 |
| 3 | 3 | OMEMADA (M) | - | - | 3 | 3 | - | 1 | 3 | 2 | 3 | 3 | 18 |
| 4 | 4 | FREY(KJ) | 1 | - | 1 | 4 | 5 | - | - | 1 | - | - | 12 |
| 5 | 5 | LOFFER(HJM) | 1 | - | - | - | 3 | 1 | 2 | - | 3 | - | 10 |
| 6 | 5 | HARBAR(KN) | 1 | 1 | 1 | 1 | 2 | - | - | 1 | 2 | 1 | 10 |
| 7 | 5 | PALMGREN(MG) | 1 | - | 1 | - | 1 | 2 | - | - | 3 | 2 | 10 |
| 8 | 6 | KNOGGE (W.BEVLEN) | 2 | - | 1 | - | 3 | - | 1 | - | 1 | - | 8 |
| 9 | 6 | STATZ(G.FORKMAN) | 1 | 1 | 1 | - | 2 | - | - | - | 1 | 2 | 8 |
| 10 | 7 | STRACK(O.BOKERN) | 1 | 2 | - | - | - | 1 | 1 | 1 | - | - | 6 |
| 11 | 8 | MOORE(S.SMITH) | 2 | 1 | - | - | 1 | - | 1 | - | - | - | 5 |
| 12 | 9 | HOGETSU(T) | 1 | 1 | - | - | - | - | - | 2 | - | - | 4 |
| 13 | 9 | COFFMAN (FA) | 2 | - | - | - | 2 | - | - | - | - | - | 4 |

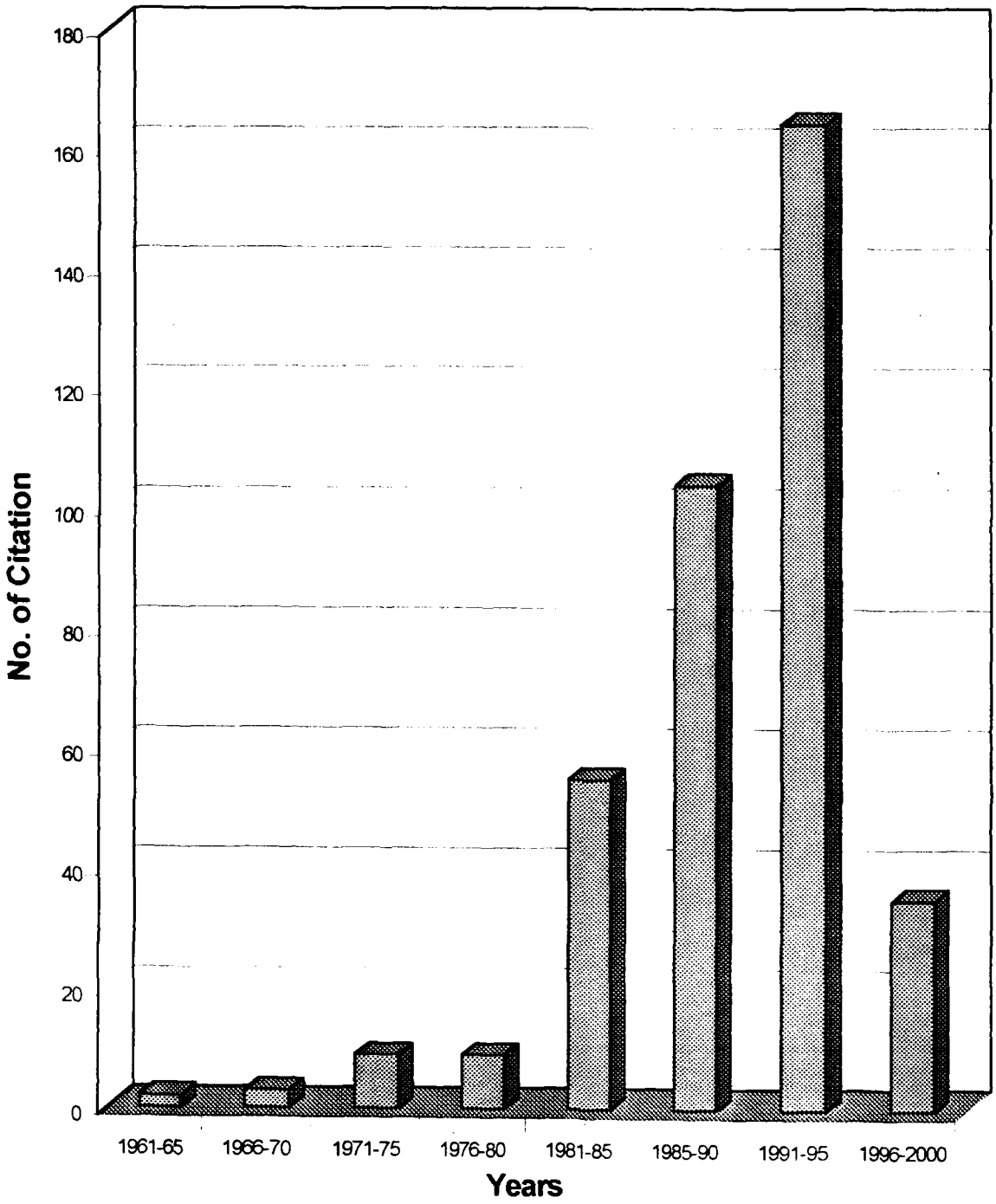
## CHROMOLOGICAL ANALYSIS OF CITATIONS

The citation were sorted in the chronological order. It was found that earliest citations dates to the period 1961--65. In this period no's of articles is 2. Increase there up to 1991-1995 is 164 articles. This is the maximum no's of articles.

# TABLE -13

| Year | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 2000 | Total | % | Cum. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1961-65 | - | - | - | - | - | - | - | - | - | 1 | 2 | 0.52 | 0.52 |
| 1966-70 | - | 2 | - | 1 | - | - | - | - | - | - | 3 | 0.78 | 1.3 |
| 1971-75 | 1 | 1 | 1 | - | 1 | - | 1 | 2 | - | 2 | 9 | 2.36 | 3.36 |
| 1976-80 | 2 | 2 | 2 | - | - | - | - | 1 | 1 | 1 | 9 | 2.36 | 6.02 |
| 1981-85 | 6 | 6 | 4 | 4 | 4 | 4 | 5 | 4 | 6 | 12 | 55 | 14.4 | 20.42 |
| 1986-90 | 12 | 8 | 13 | 10 | 8 | 7 | 8 | 7 | 5 | 26 | 104 | 27.2 | 47.63 |
| 1991-95 | 16 | 11 | 15 | 16 | 12 | 13 | 12 | 16 | 10 | 43 | 164 | 43.0 | 90.6 |
| 1996-2000 | 3 | 3 | 4 | 2 | 3 | 5 | 3 | 2 | 6 | 4 | 35 | 9.18 | 99.78 |
| Total | | | | | | | | | | | 381 | | |

## Chronological Analysis of Citation



## HALF LIFE PERIOD

Half-life is the measure of the growth of the discipline. In other words it also indicate the rate of obsolescence of the discipline.

**Citing Half Life:-**

The citation are arranged chronologically as the in the table and the half life is calculated there are 381 citation during 1991-2000 in the source items which were used.

**TABLE-14**

| Year | No. of Citation | % | *% Cumulative distribution* |
|---|---|---|---|
| 81 | 16 | 8.0 | *8.0* |
| 82 | 15 | 7.5 | *15.5* |
| 83 | 11 | 5.5 | *21.0* |
| 84 | 12 | 7.5 | *28.5* |
| 85 | 13 | 6.5 | *35.0* |
| 86 | 16 | 8.0 | *43.0* |
| 87 | 10 | 5.0 | *48.0* |
| 88 | 12 | 6.0 | *54.0* |
| 89 | 13 | 6.5 | *60.5* |
| 90 | 17 | 8.5 | *69.0* |
| 91 | 19 | 9.5 | *78.5* |
| 92 | 8 | 4.0 | *82.5* |
| 93 | 10 | 5.0 | *87.5* |
| 94 | 4 | 2.0 | *89.5* |
| 95 | 5 | 2.5 | *92.0* |
| 96 | 2 | 1.0 | *91.0* |
| 97 | 3 | 1.5 | *92.5* |
| 98 | 3 | 1.5 | *94.0* |
| 99 | 4 | 2.0 | *96.0* |
| 2000 | 6 | 3.0 | *99.0* |
| *Total* | *191* | | |

The cited half-life of literature is 20 years.

# CHAPTER-V

# APPLICATION OF BIBLIOMETIC LAW

After the analysis and interpretation of data the next steip is the application of bibliometric laws by the help of the results of the analysis of collected data.

**Laws of Bibliometrics**

i) Bradford's Law of Scattering

ii) Lotka's Inverse Square Law

iii) Zipf's Law of word occurrence

iv) Price Square Root Law of Scientific Productivity.

**Bradford's Law of Scattering**

This law states that "if scientific journals are arranged according to their decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several group of zones. Each zone have nearly same number of articles".

The formula is $1:n:n^2$ where 1 is the number of periodicals in nucleus and n is a multiplier.

On the basis of this law, I have chosen all the periodicals (366) and divided them according them according their frequency of occurrence. The first 16 periodicals contained 495 articles. Next periodicals contained 482 articles and remaining 302 periodicals contained 463 articles.

| S.No. | Zone | No. of Articles | Cum.No. of articles | No. of Journals | Cum. No. of Journals |
|---|---|---|---|---|---|
| 1 | I (Nucleus): | 495 | 495 | 16 | 16 |
| 2 | II „ | 482 | 977 | 48 | 64 |
| 3 | III „ | 463 | 1440 | 302 | 366 |

From the table it is clear that 16 periodicals have covered 1/3 of the total items, next 48 journals have covered 1/3 items and 302 journals also covered next another 1/3 items.

As the nucleus zone contains 16 journals followed by 48 journals in second zone and 302 journals in the third zone, the zone thus identified will from an approximately geometric series.

16:48:302

here 16 x 3 = (48)

16 x 3 x 3 = 144 (approximately 302)

therefore 16:16 x 3:16 x 3 x 3

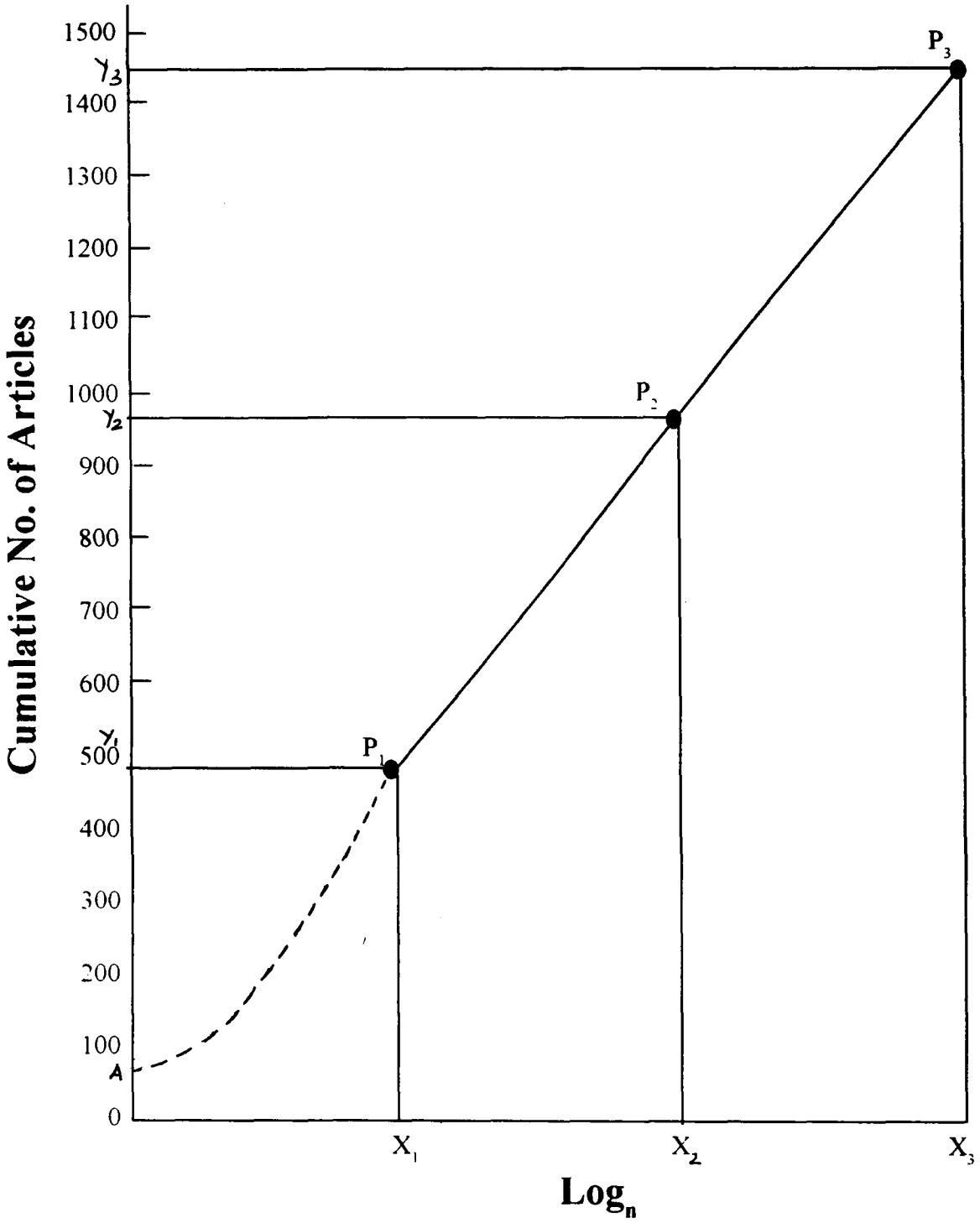
Substituting 3 = n

Then we get 16: 16n:16$n^2$

i.e. 1:n:$n^2$ (where 1 is number of journals in the nucleus and n is a multiplier)

Thus Bradford's Law is proved broadly.

## Bradford's Bibliograph



The number of journals in the nucleus and in other zones can be obtained by plotting f® and log n on semi logartithimic graph paper (a bibliograph). Where f® is the cumulative frequency of source items and log n is log of rank of journals as shown in the graph.

**Lotka's Inverse Square Law**:- During the present analysis it was observe that the 4309 authors have contributed 1440 items. Out of the 4309 authors only 1684 authors have contributed more than one paper and rest 2625 author contributed i.e. single contribution.

However according to Lotka's law scientists contributing 2 papers 3 papers, and 4 papers respectively as given below.

**1. Scientists contributing 2 papers:-**

As we know that the number of author contributing one paper is 2625. Therefore no. of Scientits contributing 2 papers may be concluded by the formula.

No. of scientists contributing n papers

= no. of scientists publishing 1 paper/$n^2$

= 2625 x $1/2^2$ =

= 2625/4

= 656.2

Thus no of scientists publishing an analysis of the data shows that only 582 authors have contributed 2 papers, which is far less than the figure of 656, obtained by applying Lotka's law.

**II Scientists Contributing 3 papers:-**

Apply the formula $= 1/n^2$

$= 2625 \times 1/3^2$

$= 2825/9$

$= 291.6$

During the analysis it was found that only 256 authors have contributed 3 papers each which is far less than 291.

**III Scientists Contributing 4-papers:-**

Applying the formula $= 1/n^2$

$= 2625 \times 1/4^2$

$= 2625/16$

$= 164.06$

The no. of authors contributing 4-papers 164. The analysis of the actual data shows that only 98 authors contributed 4-papers which is again far less then calculated figure 164.

It may therefore be concluded that the trends of research now a days have changed as compare to the period when Lotka's law was formulated. The reason may be that in modern times single authorship is decreased and joint authorship is increased, that is why on the basis of analysis of the present data it is difficult to testify the Lotak's law.

**Price Square Root Law of Scientific Productvity:-**

This law states that half of the scientific papers are contributed by the square root of the total number of scientific authors

Square root of scientific papers=

$\sqrt{4309} = 65$

half of the scientific papers = 1440/2 = 720

According to this law 65 authors should have contributed 720 (50%) scientific papers and rest of the authors next 50% scientific papers but after analysis this is found that 65 authors have contributed 656 articles so the law is neither proved nor disproved.

# CHAPTER-VI

# CONCLUSION

The bibliometric study is done on the oat -Avena Sativa the quantitative analysis pertaining to books or documents is applied in this work. The whole analysis is done at the different levels..

In the first level the data is analysed to find out the year wise distribution of articles, core journal, most productive author, country wise distribution and the most popular language.

The year wise distribution of articles

| S.NO | Year | Articles |
|---|---|---|
| 1 | 1991 | 135 |
| 2 | 1992 | 152 |
| 3 | 1993 | 145 |
| 4 | 1994 | 170 |
| 5 | 1995 | 177 |
| 6 | 1996 | 145 |
| 7 | 1997 | 122 |
| 8 | 1998 | 145 |
| 9 | 1999 | 123 |
| 10 | 2000 | 126 |

The year 1997 has the minimum no. of articles

**Productivity of Authors**

| S.NO. | Rank | Authors | Articles |
|---|---|---|---|
| 1 | 1 | STACHELIN (L.A) | 35 |
| 2 | 2 | YOUN (HYE-WON) | 34 |
| 3 | 3 | ROSE (J.L) | 25 |

**Ranked list of Journals**

| S.No. | Rank | Journals | Articles |
|---|---|---|---|
| 1 | 1 | Crop Science | 95 |
| 2 | 2 | Plant Physiology | 69 |
| 3 | 3 | Agronomy J. | 38 |

**Ranked list of Countries**

| S.No. | Rank | Country | Articles |
|---|---|---|---|
| 1 | 1 | USA | 362 |
| 2 | 2 | CANADA | 133 |
| 3 | 3 | UK | 102 |

**Ranked list of Language**

| S.No. | Rank | Country | Articles |
|---|---|---|---|
| 1 | 1 | ENGLISH | 1041 |
| 2 | 2 | JOURNAL | 96 |
| 3 | 3 | FRENCH | 77 |

**Citation part:-**

In this cited part we have given rank of authors, rank of journals forms of cited documents, cited year and half life of literature.

**Rank list of cited Authors**

| S.No. | Rank | Authors | No. of Articles |
|---|---|---|---|
| 1 | 1 | YOUN (HYE-WON) | 34 |
| 2 | 2 | MCLEAN ® | 20 |
| 3 | 3 | OMEMADA (M) | 18 |

In the citation part, study of cited author correlate with the study of authors in the first level i.e. YOUN (HYE-WON) and MCLEAN ® obtained rank I and II. In the I Level study

**FORM OF CITED DOCUMENTS**

| S.No. | Rank | TYPES OF DOCUMENTS | No. of Articles |
|---|---|---|---|
| 1 | 1 | JOURNALS | 305 |
| 2 | 2 | BOOKS | 34 |
| 3 | 3 | REPORTS | 21 |

**RANKLIST OF CITED JOURNALS**

| S.No. | Rank | NAME OF JOURNALS | No. of Articles |
|---|---|---|---|
| 1 | 1 | CROP SCIENCE | 52 |
| 2 | 2 | PLANTA | 42 |
| 3 | 3 | PLANT DISEASE | 39 |

In the citation analysis, it is found that some of the cited journals correlate with the study of journal in the first level.

**CITED YEAR**

| S.No. | Year | No. of Articles |
|---|---|---|
| 1 | 1961-65 | 2 |
| 2 | 1966-70 | 3 |
| 3 | 1971-75 | 9 |

Half life of the literature is also analysed.

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